

MESTRADO
ECONOMIA E GESTÃO DO AMBIENTE

SMART (SUSTAINABLE?) CITIES IN THE AGE OF CLIMATE EMERGENCY: WHERE DOES RIO DE JANEIRO STAND IN RELATION TO EUROPEAN BEST PRACTICES?

Luiza Josuá Cabral

M

2020



SMART (SUSTAINABLE?) CITIES IN THE AGE OF CLIMATE
EMERGENCY: WHERE DOES RIO DE JANEIRO STAND IN
RELATION TO EUROPEAN BEST PRACTICES?

Luiza Josuá Cabral

Dissertation

Master's in Environmental Economics and Management

Supervised by
Maria da Conceição Ramos
Luis Carvalho

2020

Acknowledgements

First, I would like to express my gratitude to my supervisors, Professors Maria da Conceição Ramos and Luís Carvalho, for accepting to guide me through this important step of my academic and professional trajectory. Thank you for the unwavering support, countless e-mails, meetings, skype calls, and all the time and insights that you both so kindly contributed to this work, in and out of a pandemic chaos.

I would also like to thank my friends for helping me along this long process of constant research, writing, re-writing, and re-re-writing. I deeply appreciate your relentless reminders that pauses are necessary, and that a coffee break or a wine glass with a friend goes a long way in refueling the scholarly drive.

Most of all I would like to thank my mother, Patricia, for making all of this possible. The decision to follow the environmental path was not easy. Deciding to do so in a different country, across an entire ocean, and more than 10 hours away from any family was even more so. This amazing opportunity only exists because she believes in me, because - as always – she supports me financially, emotionally, and intellectually in any challenge that I decide to face. The last couple of years have been hard on us, but one thing I am always sure of is that she will be there, steady, to give me the best advices and counsels, the occasional slap on the wrist, and all the love in the world.

Finishing this work would also be impossible without the help of my lifelong partner, Marcelo. He kept my sanity along countless hours of quarantine-frenzied research, listened to my endless complaining about the most menial things, and was always available with a smile – although sometimes a very sleepy one – to brighten my day. The distance was harsh, but we managed it. Thank you, for everything, for all of you.

Resumo

Nesta era de emergência climática, o fenómeno das *smart cities* é visto como a solução universal para os problemas que permeiam os espaços urbanos e que, inclusive, repercutem a nível regional e mundial. Entre os principais desafios está a garantia do desenvolvimento urbano sustentável, pautado em vetores que constituem o tripé da sustentabilidade moderna: economia, ambiente e equidade social. Todavia, tais aspetos não são contemplados de maneira equilibrada em todos os planos urbanos e estratégias desenvolvidas pelas cidades sob a bandeira das *smart cities*, mesmo em cidades-modelo e principalmente em cidades com restrições orçamentais. Nesse sentido, este trabalho analisou sistematicamente e avaliou crítica e comparativamente as estratégias de desenvolvimento urbano de quatro cidades europeias (Londres, Berlin, Copenhague e Lisboa), consideradas fontes de melhores práticas, relativamente à cidade objeto principal do estudo e representativa do Sul Global: o Rio de Janeiro. Os resultados deste estudo de casos forneceram um panorama mais fidedigno das melhores práticas europeias e ressaltaram insuficiências em todas as cinco cidades, em especial no que concerne os aspetos sociais. Ademais, percebeu-se a oportunidade de se transpor e/ou adaptar certas medidas e estratégias das cidades Europeias à cidade brasileira. Todavia, há ainda grandes barreiras econômicas e políticas que dificultam esta transição.

Palavras-chave: Cidade inteligente; cidade sustentável; emergência climática; desenvolvimento urbano sustentável; melhores práticas europeias; planeamento urbano; Rio de Janeiro.

Abstract

In this age of climate emergency, the smart cities phenomenon is perceived as the universal solution to all problems that permeate urban spaces, which even have repercussions at regional and global levels. Among the main challenges is ensuring a sustainable urban development, based on vectors that constitute the tripod of modern sustainability: economy, environment, and social equity. Nonetheless, such aspects are not contemplated equally in all urban plans and strategies developed by cities under the banner of smart cities, even on role-model cities and particularly in cities with budgetary constraints. In this sense, this work systematically analyzed and evaluated critically and comparatively the urban development strategies of four European cities (Berlin, Copenhagen, Lisbon, and London), considered best-practices paradigms, in relation to the city main object of study and a Global South representative city: Rio de Janeiro. The results of these case studies provided a more accurate perspective of the European best-practices, as well as exposed insufficiencies in all five cities, especially where social aspects are concerned. In addition, an opportunity has been identified in transposing and/or adapting certain measures and strategies from the European cities to the Brazilian one. However, there are still some major economic and political barriers that hinder this transition.

Keywords: Smart city; sustainable city; climate emergency; sustainable urban development; European best practices; urban planning; Rio de Janeiro.

Summary

Acknowledgements.....	iii
Resumo	iv
Abstract.....	v
Summary	vi
Tables Index	viii
Figures Index.....	ix
Acronyms and Abbreviations.....	x
Section I - Introduction	1
Section II - Literature Review	5
I. Concepts and theoretical foundation.....	5
a. Weak and Strong Sustainability.....	5
b. Sustainable Development and Urban sustainability.....	6
c. Sustainable City, Smart City or “Trendy-Hyped” City	7
II. Tensions, key issues, and debates	11
a. Sustainable Cities and policies: the “green is always good” fallacy.....	11
b. Smart Cities: socio-environmental limitations sprung from technology	12
c. Smart Sustainable Cities: a terminological solution	14
Section III – Methodology	17
I. City selection criteria	17
II. Framework of analysis.....	19
a. Classification systems	20
b. Data collection and analyses.....	22
Section IV – Empirical Analysis: Case Studies.....	25
I. Berlin.....	25
a. Strategy	25
b. First classification system.....	26
c. Second classification system.....	28
II. Copenhagen	31
a. Strategy	31
b. First classification system.....	31
c. Second classification system.....	33

III.	Lisbon	36
a.	Strategy	36
b.	First classification system.....	37
c.	Second classification system.....	39
IV.	London	42
a.	Strategy	42
b.	First classification system.....	43
c.	Second classification system.....	46
V.	Rio de Janeiro	49
a.	Strategy	51
b.	First classification system.....	54
c.	Second classification system.....	56
Section V - Results and Discussion.....		59
I.	Dichotomies analyses	59
a.	First dichotomy	59
b.	Second dichotomy	62
c.	Third dichotomy	63
II.	Research questions discussion	64
Section VI - Conclusion.....		69
References		72
Annexes		87
I.	Annex A - Initiatives	87
	<u>Berlin</u>	87
	<u>Copenhagen</u>	95
	<u>Lisbon</u>	99
	<u>London</u>	103
	<u>Rio de Janeiro</u>	109
II.	Annex B – Organizations	112
	<u>Berlin</u>	112
	<u>Copenhagen</u>	118
	<u>Lisbon</u>	123
	<u>London</u>	129
	<u>Rio de Janeiro</u>	139

Tables Index

Table 1 - Cities Overview	19
Table 2 - First Classification System (Initiatives)	21
Table 3 - Second Classification System (Organizations).....	22
Table 4 - Smart City Principles (Berlin).....	26
Table 5 - Initiatives per organization category (Berlin).....	29
Table 6 - Initiatives per organization category (Copenhagen)	34
Table 7 - Municipal Guidelines 2020/2023 (Lisbon)	36
Table 8 - Initiatives per organization category (Lisbon)	40
Table 9 - Smarter London Together Missions	43
Table 10 - Initiatives per organization category (London)	47
Table 11 - Strategic Plan 2017/2020 (Rio de Janeiro).....	52
Table 12 - Initiatives per organization category (Rio de Janeiro).....	57
Table 13 - Cities comparison (Major Domains)	60

Figures Index

Figure 1 - Initiatives per specific domain (Berlin).....	Erro! Indicador não definido.
Figure 2 - Organizations per category (Berlin).....	29
Figure 3 - Initiatives per specific domain (Copenhagen).....	32
Figure 4 - Organizations by category (Copenhagen).....	34
Figure 5 - Initiatives per specific domain (Lisbon).....	38
Figure 6 - Organizations per category (Lisbon)	40
Figure 7 - Initiatives per specific domain (London)	44
Figure 8 - Organizations by category (London).....	46
Figure 9 - Initiatives per specific domain (Rio de Janeiro).....	54
Figure 10 - Organizations per category (Rio de Janeiro).....	57
Figure 11 - Percentage of multi-specific domains initiatives by city.....	61
Figure 12 - Dichotomies Spectrum	64

Acronyms and Abbreviations

ALERJ – Assembleia Legislativa do Rio de Janeiro

BAME – Black, Asian, and minority ethnic

BRL – Brazilian Real

BRT – Bus Rapid Transit System

BSR – Berliner Stadtreinigung

CAP – Climate Action Plan

CCST/INPE - Centro de Ciência do Sistema Terrestre do Instituto Nacional de Pesquisas Espaciais

CEPERJ – Centro Estadual de Estatísticas, Pesquisas e Formação de Servidores Públicos do Rio de Janeiro

COR – Centro de Operações do Rio

ERJ – Estate of Rio de Janeiro

EU – European Union

FIRJAN - Federação das Indústrias do Estado do Rio de Janeiro

FRR – Fiscal Recovery Regime

GDP – Gross Domestic Product

GHG – Greenhouse Gases

GLA – Greater London Authority

IBGE – Instituto Brasileiro de Geografia e Estatística

ICT– Information and Communication Technology

IoT – Internet of Things

IPCC – Intergovernmental Panel on Climate Change

MCMV – Minha Casa, minha Vida

NEPO/UNICAMP – Núcleo de Estudos de População da Universidade Estadual de Campinas

NGO – Non-governmental Organization

Rio – City of Rio de Janeiro

RQ – Research Question

SDG – Sustainable Development Goals

SDP – Sustainable Development Plan

SIURB –Sistema de Informações Urbanas

SUDS – Sustainable Urban Drainage Systems

UK – United Kingdom

UN – United Nations

UNCED – United Nations Conference on Environment and Development

UNESCO - United Nations Educational, Scientific and Cultural Organization

USD – United States Dollar

Section I - Introduction

Urban population has been growing steadily in the last couple of decades, according to the United Nations' annual World Urbanization Prospect (United Nations, 2018a). On its last revision in 2018, 55% of the world's population lived in urban areas, with considerably higher percentages observed in Latin America, Caribbean and North America (above 80%), followed by Europe (74,5%) and Oceania (68,2%), with Asia (49,9%) and Africa (42,5%) significantly behind. By 2050, it's estimated that urban population will reach the 68% mark, in great part driven by developing countries which, with their expected 5,6 billion urban dwellers, will be home to 83% of global urban population and 87% of the world's total population (United Nations, 2018a).

In parallel, this meteoric and largely unplanned urbanization drive - characteristic of the present Anthropocene Era¹ – leads to many issues, the most pressing one being humanity's current and allegedly all-time greatest threat: climate emergency (Gills & Morgan, 2019; Yigitcanlar, Han, Kamruzzaman, Ioppolo, & Sabatini-Marques, 2019). According to reports from the Intergovernmental Panel on Climate Change (IPCC), the impacts of the climate crisis are extensive and of a global scale, to name a few: increased frequency and magnitude of extreme weather events (i.e. hurricanes, heat and cold waves, typhoons, etc.) increased coastal flooding, desertification and severe droughts, the rise of sea levels and temperature, destruction of marine and land ecosystems, and melting of ice caps (IPCC, 2014, 2019). These events pose significantly greater risks to urban environments, particularly in the case of developing countries where there are often aggravating factors, such as massive population density, constriction or absence of economic resources, and lack of or deficient basic urban infrastructure and services.

If taken into consideration that cities are responsible for 78% of all energy consumed and 60% of greenhouse gases (GHG) emissions worldwide, despite occupying less than 2% of the planet's surface (UN Habitat, 2017), it is undeniable that measures need to be taken in their domain to guarantee a sustainable future, especially in developing countries.

In recent years, cities have been taking an increasingly active role in planning and managing their responsibilities and impacts on the social, economic, and environmental spheres. They're often advertised as the main players on the fight against climate change, in addition to

¹ Geological era during which human activity is considered to be the dominant influence on environment, climate and ecology, according to Oxford English Dictionary, 2014.

being hubs for the development of new intelligent technologies and solutions related to higher energy efficiency, social and gender equality, improved waste and water management, as well as reduced GHG emissions, amongst many other challenges faced by humanity in the Anthropocene Era (Ahvenniemi, Huovila, Pinto-Seppä, & Airaksinen, 2017; Anthopoulos, 2017; Caragliu, Del Bo, & Nijkamp, 2011).

The debate on technology and sustainability in the urban context gave rise to two main paradigms in academia and political discourse: sustainable cities and smart cities (de Jong, Joss, Schraven, Zhan, & Weijnen, 2015; European Commission, 2016). The former, sustainable city, is said to have a higher correlation with environmental and social aspects (Ahvenniemi, Huovila, Pinto-Seppä, & Airaksinen, 2017; Bibri & Krogstie, 2017), while the latter frequently emphasizes technological and innovation elements such as Information and Communication Technology (ICT) and Internet of Things (IoT), as well as features of a predominantly economic nature (Batty et al., 2012) – notwithstanding a growing number of hybrid approaches focusing on e.g. socio-technical dimensions of smart cities (Carvalho, 2015; Karvonen, Cugurullo, & Caprotti, 2019).

While both mainstream approaches have been subjected to extensive criticism, from the absence of a proper definition that results in lack of accountability in the case of Smart Cities (Hollands, 2008) to the risk of greenwashing and preferential treatment to high profile ecological infrastructure projects in detriment of social-economically inclined initiatives in the case of sustainable cities (Martínez, Boas, Lenhart, & Mol, 2016; Schuetze & Chelleri, 2016), the global trend is undeniable. With over 240 cities undertaking some form of smart city strategy in Europe alone (European Parliament, 2014) and an expanding market expected to reach USD 3 trillion by 2020, the smart/sustainable city agenda is likely to continue growing in the future (Anthopoulos & Reddick, 2016) and significantly more so in the rapidly growing cities of the Global South (United Nations, 2018b).

That being said, this work aims to better understand the smart/sustainable city phenomenon in the current era of climate emergency from the perspective of a representative city in a developing country (i.e. Rio de Janeiro) and how does its agenda relate to the current projects of benchmark cities in Europe. It critically analyzes the agendas and projects of four major European cities considered benchmarks for their smart city strategies – London, Berlin, Copenhagen, and Lisbon – and assesses to which extent are they truly sustainable in terms of a triple-bottom-line sustainability perspective (i.e. economy, social, environment). It then proceeds to evaluate where do Rio de Janeiro's smart sustainable city projects stand in relation

to European best practices and whether or how are they adaptable to the reality of a developing country Mega City² that has distinct socio-economic, political, cultural and institutional issues.

Best practice research derives from the notion that learning from experience, from methods that have already been tested and proven effective elsewhere, is more efficient than formulating a new abstract solution (Overman & Boyd, 1994; Veselý, 2011). In this sense, it is particularly adequate for the systematic analyses of exemplars from different contexts, such as the European cities and Rio de Janeiro, allowing for the extrapolation of some concepts and ideas between the cities, as the successful practices of the formers are taken as examples worth following by the latter (with eventual adaptations when needed).

The city of Rio de Janeiro was elected as the main object of analysis for several reasons. Besides being the author's hometown, which facilitates the understanding of its history, culture, and logistics, Rio is currently faced with an unparalleled institutional and economic crisis, which could be significantly lessened or even surpassed with the implementation of better smart sustainable urban strategies. Conversely, the European Union has been on a much more stable economic situation and, in the last decade or so, it has been able to offer incentives and create bloc policies concerning the development of smart sustainable cities strategies and technologies that are generally considered examples of best practices by academia, businesses and governments alike (European Commission, 2016; Mora, Deakin, & Reid, 2019).

In order to assess the current state of Rio de Janeiro's efforts to becoming a smart sustainable city, two questions are proposed:

- 1) How are European "best practices" positioned in terms of a broad definition of sustainability (i.e. triple-bottom-line of sustainability, strong sustainability)?
- 2) Where do Rio de Janeiro's projects and agenda stand in relation to these practices?

While evidence appoints to an increasing preoccupation from governments, businesses and citizens about the environment and the social and economic impacts of climate change, many academic contributions found current urban strategies lacking, even those from cities considered benchmarks (Martin, Evans, & Karvonen, 2018; Mora et al., 2019). This work intends to assess those concerns and expose the smart sustainable city phenomena from both ends of the spectrum: role-model European cities and a currently struggling developing country city. While most recent academic contributions focus on drawing conclusions on smart cities as a whole, this study intends to critically and systematically evaluate each city's strategy and

² Cities with over 10 million inhabitants, according to the United Nations criteria (United Nations, 2018a).

initiatives, allowing for a more comparable and structured assessment method between them. At the same time, it fills the temporal gap of academic research on Rio de Janeiro as a smart city, which has mostly dwindled after the many studies pertaining to the international sports events that the city hosted in 2014-2016 (i.e. World Cup and Olympics Games).

Following the introduction on the first section of this work, the second section provides an extensive literature review and conceptualization of sustainable development and urban sustainability, weak or strong sustainability, and the prevalent city categories - with special attention to those of smart and/or sustainable cities - as well as historical background and existing tensions. This review provides the necessary basis for the opted methodology of case study analysis, further explained in Section III, and subsequent case study and discussion, in Sections IV and V, respectively. Finally, Section VI presents this work's conclusion and future thoughts on improving the smart sustainable city strategy in both benchmark cities and Rio de Janeiro.

Section II - Literature Review

In order to attain the established objectives and answer the proposed research questions, some key concepts need to be determined and discussed beforehand, such as sustainable development and urban sustainability, weak or strong sustainability, as well as the mainstream city categories modernly adopted by academia, businesses and governments, with special attention to those of smart and/or sustainable cities. This review also addresses the historical background and existing tensions and shortcomings regarding the smart and/or sustainable city phenomena, while relying on journal articles, books, conference proceedings, reports, and governments and international organizations documents in order to support the conceptualization and subsequent case study analysis.

I. Concepts and theoretical foundation

a. Weak and Strong Sustainability

Weak sustainability is a concept within environmental economics that assumes that natural capital is entirely substitutable by manufactured capital (i.e. human capital) and that there is no distinction between the types of well-being either capital generates (Hartwick, 1977; Neumayer, 2003; Solow, 1986). It relies on the so-called Hartwick-Solow rule (Erreygers, 2009), which states that declining stocks of natural resources can be offset and substituted by human capital in a way that, so long as the total stock (natural and manufactured) is maintained or ideally even increased, intergenerational equity, and consequently sustainable development, is ensured.

Alternatively, for the advocates of strong sustainability, natural capital and human capital are complementary, albeit not reciprocally substitutable (Mori & Christodoulou, 2012). Contrary to the perspective of weak sustainability, the environment on a strong sustainability standpoint is understood as a provider of a multitude of services beyond that of natural resources repository and stock. It is also responsible for assimilating the waste created by production and consumption, offering amenities, and providing the basic survival needs for human and all other forms of life. These so-called ecosystem services cannot be replaced by man-made solutions, at least not at a reasonable cost and scale (Dietz & Neumayer, 2007). Therefore, some scholars argue that, in order to ensure current and future generations are not compromised, critical environmental aspects should not be impaired by the economy and could even be considered restrictions to economic growth (Nourry, 2008). In that way, strong sustainability is a concept

more closely related to most modern definitions of sustainable development and overall sustainability, which are predominantly focused on promoting the balance between social equity, protection of the environment and economic development (Bibri & Krogstie, 2017; Hiremath, Balachandra, Kumar, Bansode, & Murali, 2013; Yigitcanlar, Kamruzzaman, et al., 2019).

b. Sustainable Development and Urban sustainability

In 1987, the concept of sustainable development was first introduced into international policy discourse by the Brundtland Report where it was described as a form of development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987, p. 16). In the years that followed, sustainable development became the dominant aspect of the environmental movement and began to permeate the speech of policymakers, businesses, and academics alike. Bibri & Krogstie (2017) describe it as “a process of change and strategic approach to achieve the long-term goals of sustainability: a balanced socio-ecological system” (p. 188).

On an urban perspective and in line with the previously mentioned authors’ understanding of sustainable development, Hiremath et al. (2013) describe sustainable urban development or urban sustainability as a means to “achieving a balance between the development of the urban areas and protection of the environment with an eye to equity in income, employment, shelter, basic services, social infrastructure and transportation in the urban areas.” (p. 556).

Conversely, urbanization on the scale that is seen today threatens this equilibrium and raises several challenges regarding the environmental, social, and economic sustainability of cities. Rapid and disorganized urban growth puts enormous pressure on urban systems such as those related to waste and water management, energy consumption, transport network saturation, social inequality, public health overload, and so on (Bibri & Krogstie, 2017). Nonetheless, scholars believe that the balance between economic and urban development and the protection of the environment and overall sustainability can be achieved by ensuring that cities proactively design and operate their processes, plans and policies in a multi-dimensional capacity that simultaneously includes economic, social and environmental aspects (Shmelev & Shmeleva, 2019; Sodiq et al., 2019; Yigitcanlar, Kamruzzaman, et al., 2019).

These three facets of sustainable development - economic, social, and environmental - are what most scholars denominate as the triple bottom line of sustainability, indispensable

minimum requirements to ensure urban and any other form of sustainable development (de Jong et al., 2015; Mori & Christodoulou, 2012). While some academics like Sodiq et al. (2019) slightly alter elements of this triad (i.e. social for equity), others include additional aspects like governance (Yigitcanlar & Kamruzzaman, 2018) and technology (Macke, Casagrande, Sarate, & Silva, 2018), among others, resulting in quadruple and beyond bottom lines and criteria.

From a more institutional perspective, as of 2015, the United Nations (UN) has taken a leading role in coordinating international efforts in order to achieve sustainable development on a global scale with the launch of the Sustainable Development Goals (SDG) and the 2030 Agenda. The 17 SDGs, and its corresponding 232 indicators, are interconnected objectives created to serve as a manual for a better and more sustainable future, shaping global efforts to promote sustainability, gender and social equality, sustained economic growth and overall prosperity worldwide (United Nations, 2015).

It comes as no surprise that the role of cities as major players in this endeavor has been taken into consideration by the UN and therefore given a specific goal, SDG 11 'Sustainable Cities and Communities', whose aim is to 'make cities and human settlements inclusive, safe, resilient and sustainable' (United Nations, 2015). Among its 10 targets and 15 indicators, matters such as adequate and affordable housing, sustainable transport systems, sustainable urbanization and spatial planning, culture, strategic prevention of natural disasters, mitigation of climate change, and social equality are endorsed and measured (United Nations, 2015).

In addition to the institutional pressure, there has been a global escalate on popular demand for the protection of the environment and for a more sustainable way of life, so businesses and cities around the globe are now on the race to adapt to these increasingly exigent consumers and voters. That being said, the SDG initiative on sustainable urban development can be understood as not only an international agreement with corresponding indicators and targets that cities are expected to meet by 2030, but also as an opportunity for governments and businesses to cut costs, develop more efficient solutions and processes, and attract social and economic capital for their projects and programs (Shelton, Zook, & Wiig, 2015).

c. Sustainable City, Smart City or “Trendy-Hyped” City

Traditionally, the term sustainable city was used to describe cities where urban strategies prioritize aspects related to the natural environment and where resources are managed in a balanced way alongside economic development (Camagni, Capello, & Nijkamp, 1998). Throughout the years, the concept has evolved beyond the natural environment element as the

sustainability discourse took more of a strong sustainability perspective and new city categories and challenges emerged.

As indicated by de Jong et al. (2015) extensive bibliometric analysis of the 12 most frequently used city categories in relevant academic production over the last decade, the sustainable city is predominantly understood as a multidimensional umbrella term. In accordance with its comprehensiveness, the study showed that sustainable city is the most reoccurring term in literature, as well as the most interconnected one, with close links to concepts such as “green city” and “eco-city”.

The modern concept of sustainable city, however, goes beyond the strictly ecological aspects of the eco-city coined by Richard Register in 1987 (Register, 1987). It has since then expanded and incorporated aspects such as sustainable urban development, social and gender equity, energy and resource efficiency, and sustainable economic development (Sodiq et al., 2019; Yigitcanlar & Teriman, 2015).

As meticulously defined by Bibri and Krogstie (2017), a sustainable city can be described as:

“an urban environment designed with the primary aim of contributing to improved environmental quality and protection and social equity and well-being over the long run, which can be attained through adopting sustainable development strategies to foster advancement and innovation in built environment, infrastructure, operational functioning, planning, and ecosystem and human service provisioning, while continuously optimizing efficiency gains.” (p. 193).

According to Yigitcanlar and Teriman (2015), sustainable cities can be understood as a by-product of the sustainable urban development paradigm, perceived as a way to improve “the quality of life in a city, including ecological, cultural, political, institutional, social and economic components” (p. 341), without compromising future generations. As per Sodiq et al. (2019), there are certain key elements to a sustainable city, such as education, renewable and efficient energy, sustainable transportation and building, waste management, among others. As stated by the authors, a sustainable city should be a “knowledge-based city”, where “every aspect of the city must show efficiency” (p. 974).

This concept of knowledge-based cities, or simply knowledge cities, guards some similarities with the other predominant city paradigm, the smart city. Knowledge-cities are often associated with terms such as creative economy, knowledge-based urban development, and

human capital while being distinguishable from smart cities by its lack of emphasis on ICT and other more technology-related aspects (de Jong et al., 2015).

As a rule, technology has always played a key role in shaping the city of the future (Angelidou, 2015). Ever since the industrial era, it has been portrayed as the major driver of cities development and lauded as the universal solution to a multitude of urban problems (Angelidou, 2015; Bibri & Krogstie, 2017; Lee, Hancock, & Hu, 2014; A. M. Townsend, 2013). According to A. M. Townsend (2013), cities and technology have had a symbiotic relationship whose origin dates back nearly six thousand years. In his book, the author emphasizes the role of writing as the world's first-ever information technology, created to "keep tabs on all of the transactions, rituals and rulings" (p. 5).

Over the years, scholars have proposed innumerable concepts pertaining to this relationship between technology – modernly in the form of ICT, IoT and "Big Data" - and cities, including but not limited to: "wired cities" (Dutton, Blumler, & Kraemer, 1987), "intelligent cities" (Komninos, 2013), "digital cities" (Ishida & Isbister, 2000) and "information cities" (Batty et al., 2012). Alternatively, in the last couple of decades the nomenclature that has captivated the most followers amongst academia, businesses, governments, international organizations, and media is that of the aforementioned smart city (Kitchin, 2015).

Even though geographers and urban planners "have been using increasingly sophisticated quantitative and computational methods to understand cities since at least the 1950s" (Shelton et al., 2015, p. 15), the concept of smart city has been said to have made its first appearance in the early 1990s (Angelidou, 2015; Yigitcanlar, Kamruzzaman, et al., 2019). Gaffney & Robertson (2018) trace the origin of the term to the new paradigms that emerged in North America out of the tension created between the rise of suburbs and the decline of central business districts in the 1990s. Its roots are also often associated with the smart growth and new urbanism movements from the same decade, which essentially proposed new strategies to urban planning regarding challenges such as urban sprawl and related environmental externalities (Hollands, 2008; Kitchin, 2015; Yigitcanlar, Kamruzzaman, et al., 2019).

Nonetheless, despite the ongoing academic and institutional debate, the definition of smart city is still considered controversial, lacking both in clarity and scope (Hollands, 2008; Komninos, 2013; Mora et al., 2019). In the absence of an unequivocal and widely acknowledged concept, scholars have proposed a multitude of definitions as to what a smart city should be or what it should entail. Their contribution can be divided into two dominant approaches: 1) the

technological or ICT perspective and 2) the socio-economic perspective (Bibri & Krogstie, 2017), or the so-called holistic approach (Mora, Deakin, & Reid, 2018).

In line with the first mainstream approach, Kitchin (2015) states that smart cities can be understood as the “technological version of a sequence of neoliberal-infused new urban visions, including competitive cities, creative cities, sustainable cities, resilient cities and green cities” (p. 133). On the same note, Lee et al. (2014) understand that it is through the connection between ICT-based technology and urban infrastructures that a city can resolve its various urban problems and be considered smart.

Söderström, Paasche, and Klauser (2014), in their analysis of IBM’s smarter city campaign, also highlight the technological aspect of the smart city. In a general sense, the authors argue that “smart cities involve the creation of new relations between technology and society”, where “urban infrastructures and everyday life in cities are optimized through technologies provided by IT companies” (p. 309). The same can be said about A. M. Townsend (2013), who describes smart cities as “places where information technology is combined with infrastructure, architecture, everyday objects, and even our bodies to address social, economic and environmental problems” (p. 70).

In a broader perspective, the second approach takes on a more holistic view, while being closely related to the bottom lines of sustainability and prevalent sustainable city concepts. In that sense, Caragliu, Del Bo, and Nijkamp (2011, p. 70) propose that a city can be only considered smart “when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance.” On the same note, Ahvenniemi et al. (2017) stresses the importance of social and sustainability-related indicators and parameters in shaping effective and sustainable smart cities. Likewise, Macke et al. (2018) emphasize the role of smart cities in generating sustainable economic development and improving the quality of life and wellbeing of its citizens.

Distancing itself even further away from the technocentric view, the work of Anthopoulos (2017) questions the veritable need for ICT-based infrastructure or services for a city to be considered smart. The study analyzes the case of Geneva, a city that manages its local needs with ingenuity and a heavy focus on city planning and sustainable mobility, without necessarily relying on ICT solutions. Other authors, like Giffinger, Haindlmaier, and Kramar (2010), don’t strictly propose a definition of smart city, choosing instead to focus on

enumerating its correspondingly smart components (i.e. economy, governance, environment, people, mobility and living or quality of life).

The smart city label is also largely seen as a competitiveness asset: a way for cities, businesses, and other organizations to advertise their potential and attract economic and human capital to their midst (Angelidou, 2015; Shelton et al., 2015). So, it comes as no surprise that cities aim to become – or at least to be perceived as - smart by any means necessary. Moreover, the ongoing debate about the correct or at least the most widely accepted definition of smart city allows for a corresponding lack of accountability, as cities can proclaim to be smart by one definition or another according to their needs and desires, without actually providing any type of measurable urban development (Hollands, 2008). The issue is further complicated by the abstractiveness of the main objectives related to smart cities – such as sustainability, quality of life, and smartness –, which are difficult to quantify and define as individual goals themselves (Gaffney & Robertson, 2018).

II. Tensions, key issues, and debates

a. Sustainable Cities and policies: the “green is always good” fallacy

While sustainable cities ideally rely on the bottom lines of sustainability - meeting economic, social and environmental needs as a whole -, there is a growing number of studies that affirm that, in many cases, sustainable urban policies lean too heavily on the green/ecological discourse due to its higher visibility and popularity, and in that way fail to promote a more equitable and thoroughly sustainable urban development (Checker, 2011; Martínez et al., 2016; Schuetze & Chelleri, 2016).

That was the case in Curitiba, Brazil, a city once considered a role model for sustainable urban planning and recipient of innumerable green city awards. As reported by Martínez et al. (2016), over the years Curitiba has fallen into a loop of self-promoting propaganda - led by the discursive institutionalism of public administrators and propagated by its own citizens - which eventually became detached from reality as the city continued to boast about its renowned sustainable city status while doing little to nothing to effectively improve its urban sustainability. With the irregular and unplanned growth of the city, it began to struggle with the classic urban challenges that effective sustainable urban strategies would be able to avoid or mitigate, such as increased flooding, water bodies pollution, transport congestion, as well as social segregation and exclusion from green spaces. Even then, it continues to preserve its sustainable city status

through misleading political and institutional discourses that prevent change and the ideal realignment of Curitiba's reality with its reputation.

Although it's a term most often associated with corporations, this type of deceptive behavior from the likes of the one perpetuated by the city of Curitiba can be understood as a form of greenwashing³ (de Freitas Netto et al., 2020; Laufer, 2003). Similarly, Schuetze and Chelleri (2016) warn about a fallacy surrounding high-end sustainability mega-projects related to urban greenwashing practices, gentrification, and blind technocratic solutions. According to the authors, this perspective of an "oversimplification of the 'economic growth' through greening paradigm" is unsustainable, and can be avoided by adopting "integrated, complex, and stepwise urban planning and design processes" (p. 12), much like the ones supported by the advocates of holistically perceived smart cities.

On the matter of gentrification and social exclusion, according to Checker (2011)'s analysis of North American cities environmental policies, as sustainability gains more popularity and political pull, urban policies tend to concentrate on climate change and environmental amenities (i.e. parks, trees, and green spaces) while at the same time overshadowing the "long-standing issue of unequally distributed environmental burdens (i.e., toxic waste facilities, bus depots, waste-producing industries) in low-income neighborhoods and communities of color" (p. 214). In a process that the author describes as Environmental Gentrification, through a selectively adopted sustainability discourse, high-end environmental-friendly developments are proposed as a form of urban renewal and revitalization of the less privileged areas of a city, eventually leading to the displacement of its low-income residents and inequitable social and urban development.

b. Smart Cities: socio-environmental limitations sprung from technology

One of the argued main pitfalls of the smart city movement is its often overly technocentric, bordering on technocratic perspective of development (Söderström et al., 2014; A. Townsend, 2013; Yigitcanlar, Kamruzzaman, et al., 2019). As argued by Söderström et al. (2014), the technology-centered smart city storyline revolves around substantial marketing strategies and a problematization discourse led by corporate technology giants such as IBM, Siemens, and Cisco. According to the author, IBM presents itself and its smart technologies

³ As stated by de Freitas Netto, Sobral, Ribeiro, and Soares (2020) greenwashing represents "a deliberate corporate action with the presence of misleading elements, focused on the deception of stakeholders" (p.10), in which these misleading elements are related to sustainable and/or "green" measures or products.

strategies as the “only solution for various urban problems and hence becomes an OPP⁴” (p. 310), ensuring its dominant position as the unavoidable provider on the expanding market of smart cities.

Beyond the biased storytelling of technology giants, this technocentric perspective has been subject to criticism by some scholars in terms of its social impacts and digital accessibility, due to an uneven distribution of innovations (Angelidou, 2015; Martin et al., 2018; Shelton et al., 2015). Angelidou (2015) warns of the hardships involved in managing such a complex ecosystem of people, institutions, and stakeholders, and that special attention should be given to avoid any “digital disparities and spatial polarization” (p. 103). On the same note, Shelton et al. (2015) argues that smart city initiatives, much like any other urban phenomena, are unevenly distributed among the city spaces, resulting in some areas, people, or activities being privileged over others. In a case study of smart city initiatives in the city of Philadelphia, the authors observed that the project limited itself to the education and digital literacy of people from poorer neighborhoods, and, although it provided means for these marginalized residents to insert themselves in better-paying jobs, it failed to address the issues of mobility and daily commuting from the low-income districts to the city’s digital and innovation zones. Overall, the project acted as an advertisement of the city’s supposedly competitive and digitally apt workforce, “while longstanding socio-spatial inequalities were left unaddressed” (Shelton et al., 2015, p. 21).

In addition, Yigitcanlar, Kamruzzaman, et al. (2019) raise the topic of costs and planned obsolescence of the technologies deemed necessary to create a smart city. Integrating an entire city with sensors and IoT devices represents an extensive investment, especially when considering the inevitable need for replacements as modern technology has a tendency of rapidly becoming obsolete. Nonetheless, as stated by the authors, “technology does not necessarily need to be new to be effective, and particularly in the global south context, the most effective solutions often involve retrofitting as well as innovative uses of existing and relatively inexpensive technology” (p. 361).

However, the retrofit solution, much like its less commonly adopted counterpart - smart cities “from scratch”-, has its advantages and disadvantages (Carvalho, 2015). While the piecemeal introduction of improvements on a pre-existing socio-technical reality of a city can benefit from the built environment and evolve from the processes already in place, it may

⁴ Obligatory Passage Point: a place (a geographical one or an institution), or a procedure that becomes unavoidable (Söderström et al., 2014, p. 309).

struggle with the integration of mismatched infrastructures, clunky regulations, and consolidated business practices, as well as social and political resistance to change.

Conversely, smart city pilots created from scratch allow for highly articulated, technology-based infrastructures – such as grids, buildings, sewers, street plans, and transport lines – as they are conceived from the start as a seamlessly unified system. According to Carvalho (2015), it also enables more flexibility, as “dedicated pilots ‘from scratch’ make it easier to test, change and frequently adapt new technologies on-the-go.” (p. 9). Nonetheless, the author mentions two downsides to this method: 1) the difficulty of creating an innovation ecosystem, as many solutions used on the pilots tend to be imported from other technology think-tanks, and not home-grown; and 2) the lack of social and community diversity, as the city predominantly attracts elite IT companies and personnel, thus failing to fully relate to the “real world” outside the pilot.

c. Smart Sustainable Cities: a terminological solution

Another issue brought by some academics in the last five years is the apparent lack of correlation between many smart city policies and one of its allegedly main intended targets, sustainability (Ahvenniemi et al., 2017; Martin et al., 2018; Yigitcanlar & Kamruzzaman, 2018). While analyzing a set of smart city and urban assessment frameworks, Ahvenniemi et al. (2017) concluded that although environmental sustainability is frequently reported as an essential target of smart cities, “environmental indicators are clearly underrepresented in the smart city frameworks” (p. 241). On the same note, Martin et al. (2018) review of empirical studies conducted on European and North American cities determined that, in practice, smart city initiatives “reinforce the focus on delivering unsustainable forms of economic growth and consumerist cultures, while neglecting social equity and environmental protection” (p. 276).

In an effort to guarantee that smart city agendas abide by sustainable targets, some scholars have since then proposed the use of a new terminology, smart sustainable city, which has been getting more adepts over the years as social-economic and environmental issues continue to emerge from narrow-minded smart cities strategies already in play (Ahvenniemi et al., 2017; Bibri & Krogstie, 2017; Kramers, Höjer, Lövehagen, & Wangel, 2014). According to this line of thinking, these issues could be avoided by ensuring that the other complex aspects of what makes a city, a city - it's people, culture, environment, and economy -, are dutifully contemplated, measured, and evaluated in the context of its urban development strategy and framework.

That being said, it is important to reiterate that, while technology is indeed an important part of modern city planning, it must not be the sole criteria for assessing urban development, with the risk of exacerbating existing socioeconomic and spatial disparities and limiting the discourse to the sterile solutions provided by technology giants, ever so eager to capitalize on the smart city buzz. That is precisely why the holistic or broad perspective of smart city – and the smart sustainable city terminology - has been gaining traction in the last couple of years: to address these exposed tensions and shortcomings from sustainable and smart cities alike. Nonetheless, the question remains as to what most cities - even those generally considered benchmarks, and especially those in developing countries – are actually doing in the context of their smart/sustainable city agendas, and how much of it is truly smart, sustainable and overall advantageous for their citizens and the environment.

In conclusion, aspects such as the previously mentioned strong sustainability and triple-bottom lines of sustainability are of the essence when discussing the matter of urban development in order to ensure a balanced and long-term-oriented approach (Dietz & Neumayer, 2007). Nonetheless, similar to the definitions of smart city and sustainable city, these are broad concepts that to this day still give room to interpretation and discussion. As this work has presented throughout the literature review, having a smart or sustainable city label does not necessarily imply being a smart sustainable city. The smart city label is often reduced to a self-congratulatory promotional vehicle used by cities to flaunt their strong suits and mask their deficiencies in order to attract human and economic capital. (Shelton et al., 2015). In this sense, there is a perceptible pattern: cities that lean towards the sustainable end of the scale tend to perceive sustainable as strictly green and forego some of the social and economic concerns; and cities that focus on smartness often disregard social and environmental aspects in favor of a technocentric and economy-driven approach to development (Checker, 2011; Martínez et al., 2016; Schuetze & Chelleri, 2016).

This combination of controversial concepts and biased practice gives rise to the multitude of tensions and debates presented along the previous sub-sections (i.e. environmental gentrification, socio-digital disparities, technocracy), which tend to permeate most smart sustainable cities reviewed in literature to some degree. In that respect, it is reasonable to consider that the cities this work analyses are also susceptible to these deficiencies. The general assumption is that the European benchmark cities are the most likely to succeed in addressing these issues. However, there is an observable trend in European cities to “promote economic growth at the expense of environmental protection and social equity”, which was already

observed before by Martin et al. (2018, p. 273), as well as Ahvenniemi et al. (2017). Conversely, the literature concerning Rio de Janeiro suggests that the city has had a flawed ascension as a technology-inclined smart city during the aforementioned international sports events period, which has left the city to deal with its secular socio-spatial inequalities without benefiting much from the smart sustainable city trend (Gaffney & Robertson, 2018; Shmelev & Shmeleva, 2019).

The systematic analyses proposed in this work aims to test these assumptions and to better understand the smart sustainable city phenomenon in both ends of the spectrum: the most likely to be effectively smart and sustainable (i.e. the European benchmark cities) and the least likely to be able to achieve this balance (i.e. Rio de Janeiro). Ultimately, this methodology, which is better explained in the following section, will allow for the answering of the two research questions:

- 1) How are European “best practices” positioned in terms of a broad definition of sustainability (i.e. triple-bottom-line of sustainability, strong sustainability)?
- 2) Where do Rio de Janeiro’s projects and agenda stand in relation to these practices?

Section III – Methodology

The chosen methodology to answer the RQs is that of a qualitative and multiple case study analysis based on Robert Yin's (2009) lessons on case study research and methods. Yin (2009) describes the case study as “an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (p. 18). In other words, the case study methodology is ideal when the question one aims to answer concerns a phenomenon so intrinsically indissociable from reality that a concrete, context-dependent analysis – as opposed to a predictive, universal one – is the best if not only way of achieving a reliable and valid answer (Flyvbjerg, 2006; Matos & Pedro, 2011).

That is the case when analyzing the smart sustainable city phenomena. Contextualized and interpretation-dependent factors, such as a city's political and economic inclinations and strategies, cultural background, and social fabric, are just as relevant – if not more – than objective and quantitative ones, such as its population, Gross Domestic Product (GDP), and territory.

Initially, the European cities were observed as critical and paradigmatic cases, where the smart sustainable city agenda was most likely to be effective and as such could be used as benchmarks. Conversely, Rio de Janeiro was envisioned as the deviant paradigmatic case, the one least likely to achieve consistent smart sustainable city initiatives. This stage of the case study methodology allowed for a critical evaluation of each case individually, through a process of falsification/verification of the previously “most/least likely” assumptions, before proceeding to the comparative assessment of Rio de Janeiro in relation to the supposed benchmarks (Flyvbjerg, 2006).

I. City selection criteria

The criteria for selecting the specific cities object of study were multiple. Matters such as city ranking, the existence of previous academic production for comparison, availability of information on the city's projects, city dimension, and cultural similarities were taken into consideration to select the representatives of European best practices. In the case of Berlin, Copenhagen, and London, their frequent placement in high positions - often among the Top 5 or 10 - on various smart and/or sustainable cities rankings (Arcadis, 2018; IESE, 2018; Roland Berger, 2019; Shmelev & Shmeleva, 2019), as well as the accessible information about ongoing

projects, were main factors on their selection as benchmarks. Additionally, London's similar dimension and population to the main object of study, Rio de Janeiro, was also a relevant factor for this assessment as both are Mega Cities prone to facing similar challenges in terms of urban infrastructure.

Lisbon, while not amongst the highest-ranking cities on most indexes, often maintains a good position (50th to 60th place), especially when compared to Rio de Janeiro's customary placement above the 120th place. The city was chosen mainly due to the projects it established for its candidature for the European Green Capital Award 2020 - that culminated in Lisbon's selection in 2018 (Câmara Municipal de Lisboa, 2018) - as well as its cultural similarities and historical connections with Rio de Janeiro, once the capital of the former Portuguese colony of Brazil.

As for the main object of study, Rio de Janeiro is a megacity that covers a metropolitan region with over 12 million inhabitants. The city has recently hosted two global sporting events (2014's World Cup and 2016's Olympic Games) which were particularly demanding in terms of technology and city infrastructure (Gaffney & Robertson, 2018). However, Rio is currently struggling with an economic and trust crisis, as well as an unprecedented violence spike and overall quality of life decline, all of which are steadily driving citizens and businesses away from one of Brazil's most famous and loved cities. While the city has already implemented some smart sustainable projects⁵ with arguable rates of success, it can benefit from the experience of the proposed European benchmarks as a way to capitalize on the smart sustainable city trend and opportunities and overcome its critical situation.

Furthermore, Rio can be understood as a representative city of the Global South, as it garners most of the characteristics and issues commonly associated with the term, such as high population density, socio-spatial inequalities, political turmoil, and uneven development (Shatkin, 2007). As such, its systematic analysis under the same parameters used for the European benchmark cities is invaluable to better understand how the smart city phenomena has been developing in a typical Global South city, and how much of it has been adapted to meet the local needs.

On a side note, all 5 cities take part in a couple of international city coalitions that work towards sustainable urban development and city smartness, such as the C40 Cities⁶ and

⁵ Such as the Bus Rapid Transit (BRT) system, Bike Rio, and the *Centro de Operações do Rio* (COR) (BRT, 2019; Bike Rio, s/d; COR, s/d).

⁶ A network of the world's greatest cities committed to taking action to address climate change and to create a path towards a more sustainable and prosperous future (C40 Cities, 2020).

UNESCO's International Coalition of Inclusive and Sustainable Cities (ICCAR)⁷. Likewise, London and Lisbon are both part of the Sharing Cities⁸ lighthouse program, which fosters international collaboration between cities and industries towards scalable smart sustainable city solutions and aims to replicate them in other fellow cities.

Table 1

Cities Overview

City	Population	GDP (in euros)	Strategy	Official website	No. Initiatives
Berlin	3.6 Million (in 2018)	€ 145 b (in 2018)	Centralized	https://www.smart-city-berlin.de/en/home/	149
Copenhagen	623.500 (in 2019)	€ 122 b ⁹ (in 2018)	Decentralized	https://urbandevelopm-entcph.kk.dk/indhold/smart-city	101
Lisbon	506.600 (in 2018)	€ 73 b (in 2018)	Centralized	https://lisboainteligente.cm-lisboa.pt/ https://www.london.gov.uk/what-we-do/business-and-economy/supporting-londons-sectors/smart-london/smarter-london-together	114
London	9 million (in 2019)	€ 572 b (in 2018)	Centralized	https://www.london.gov.uk/what-we-do/business-and-economy/supporting-londons-sectors/smart-london/smarter-london-together	152
Rio de Janeiro	6,7 million (in 2019)	€ 93 b (in 2017)	Centralized	No evidence	61

Sources: own elaboration based on CEPERJ (2017); European Central Bank (s/d); Eurostat (2020); IBGE (2019); Københavns Kommune (2020b); Pordata (2019); Statistik Berlin Brandenburg (2018).

II. Framework of analysis

The theoretical basis for the analysis is an adaptation of Mora et al. (2019)'s proposed smart cities framework, which is divided by the authors into 4 fundamental dichotomies: 1) technology-based or holistic strategy; 2) double or triple/quadruple-helix model of collaboration; 3) top-down or bottom-up approach; 4) mono-dimensional or integrated intervention logic. The first dichotomy addresses one of the main tensions surrounding smart

⁷ Formerly International Coalition of Cities against Racism-ICCAR, it's an UNESCO initiative to promote international cooperation and establish a network of cities interested in sharing experiences in order to improve matters such as sustainability, education, housing, employment and cultural activities, among others (ICCAR, 2019).

⁸ Consortium of 6 cities and 34 partners from industry, NGO's and academia across Europe (Sharing Cities, s/d)

⁹ This value refers to Hovedstaden, Copenhagen's administrative region, as separate values for Copenhagen in terms of GDP were not found.

cities, its overly technocentric perspective, as mentioned in the previous chapter. The second pertains to the agents involved in the initiatives: if only two organizations (usually government and business) are the conductors, the project is considered to have a double-helix approach, if universities and the community are also participants, it is deemed a triple/quadruple-helix model of collaboration. The third dichotomy involves the flow of change: if it is government/industry-led (top-down) or community-driven (bottom-up). And finally, the fourth one concerns the intervention logic, if the smart city strategy is primarily directed towards one goal (i.e. energy efficiency) or if it is otherwise multi-dimensional and integrates multiple aspects (i.e. health, environment, economy, mobility, etc.).

This work's methodology proposes an adaptation of Mora et al. (2019) classification system and dichotomies, choosing to consolidate dichotomies 1 and 4 into a single category: segmented (technocentric or otherwise) vs holistic approach. The reason behind this consolidation is that, as observed in the literature review, technocentrism is not the only bias that surrounds the smart sustainable city paradigm. In that sense, unifying the first and fourth dichotomies ensures that technocentrism is not singled out as the only partiality in the cities' strategies, allowing for an equivalent analysis of any other biases that eventually occur. The other dichotomies, double¹⁰ or triple/quadruple-helix model of collaboration and top-down or bottom-up approach remain mostly the same. Each city's initiatives and projects were cataloged under two classification systems: the first classification system, represented by **Table 2**, addresses the consolidated first dichotomy, while the second one serves the analysis of dichotomies 2 and 3, as per **Table 3**.

a. Classification systems

The first classification system is related to the goal of the initiative, the urban challenge it aims to address. As such, 17 specific domains - based on the 12 utilized in Mora et al. (2019) work – and 3 major domains were employed for the analyses, which resulted in the **Table 2** below.

¹⁰ The original framework by Mora et al. (2019) did not account for initiatives taken by a single organization, which has been the case with some initiatives analyzed in this study. To maintain the dichotomy and because an individual initiative is in fact a null degree of collaboration, the double-helix model of collaboration end of the scale has been expanded to include individual initiatives.

Table 2*First Classification System (Initiatives)*

Major domain	Specific domain	Description
Environment	1. Energy	Energy efficiency and sustainability (i.e. grids, storage, street lighting, renewables).
	2. Air	Air quality measurement and control, and CO ² reduction.
	3. Water	Water distribution, quality, and management.
	4. Waste	Waste management, treatment systems and other solutions (i.e. recycling, upcycling).
	5. Green & Public Spaces	Gardens, parks, and other public spaces.
	6. Mobility & Transport	Urban mobility with the use of accessible and sustainable public and other alternative transport systems.
Social	7. Residential Buildings & Districts	Efficient, accessible, and improved management of sustainable buildings and districts.
	8. Public Health	Improved quality, accessibility, and organization of public health services and structures.
	9. Social Inclusion & Diversity	Improved social inclusion, diversity, and reduction of social disparities.
	10. Culture	Protection of cultural heritage and incentive to cultural productions.
	11. Education	Improved educational programs, systems, and renovation/construction of schools, universities, and research facilities.
	12. Accessibility	Improved accessibility of products, services, structures, or environments for disabled or elderly people.
	13. Public Safety & Security	Public protection of citizens, institutions, and organizations against threats to their well-being (i.e. law enforcement, fire and emergency, natural and man-made disasters).
	14. E-Government	Increased accessibility and convenience of public information and services to citizens and temporary residents.
Economy	15. Industrial Districts & Business Accelerators	Fostering of economic activities and employment, and creation of industrial or business parks.
	16. Digital Infrastructure & Solutions	Digital solutions (i.e. ICT, IoT, Big Data, Industry 4.0, Apps).
	17. Other	Initiatives that do not belong to the previous categories entirely or in part.

Source: own elaboration based on Mora et al. (2019).

Concerning the major domains, virtually all the analyzed initiatives have potential economic impacts, although the same cannot be said about the Social and Environmental domains. Nevertheless, specific domains nos. 15 and 16 have a predominantly Economic nature

and were therefore classified as such. By analyzing the correlation between major domains, as well as with the overall number of initiatives, an inference can be made about each city's position in terms of each bottom-line of sustainability (social, economy, environment), in addition to other previously mentioned concepts, such as sustainable development and environmental gentrification. For instance, if a city has significantly fewer initiatives that fall under the social major domain than those that fall under the environmental or economic ones, it can be argued that from the standpoint of a triple-bottom-line sustainability, it is not sustainable at all. Similarly, if environmental measures are taken without consideration for socio-economic ones, it can indicate a tendency for environmental gentrification.

The second classification system pertains to the actors involved in each initiative and is further described in **Table 3** below.

Table 3

Second Classification System (Organizations)

Category	Description
A. Industry	Businesses involved in consultancy and services or goods providing and businesses associations.
B. Government	Local, regional, or national governmental authorities, regulators, and public companies or associations.
C. Civil Society	Communal organizations, other representatives of civil society and individuals ¹¹ .
D. Scientific Community	Universities, independent researchers and other educational or research institutions.
E. Other	Organizations that do not belong to the previous categories.

Source: own elaboration based on Mora et al. (2019).

b. Data collection and analyses

Information on the cities' projects and agenda was retrieved from government and companies' websites, previous empirical academic studies, reports, and policy documents, from December 2019 to June 2020. The majority of the information regarding current smart city projects and urban policies was available in either English or Portuguese on each city's official website, as well as its correspondent smart-city domain, when existent (e.g. Smart City Berlin,

¹¹ Civil society is defined by the World Bank as "the wide array of non-governmental and not for profit organizations that have a presence in public life, express the interests and values of their members and others, based on ethical, cultural, political, scientific, religious or philanthropic considerations" (World Bank, 2020a).

2019). In the cases where data was only available in German or Danish, the information was translated through Google translator to allow for the thorough analyses and categorization under the classification systems. The information necessary for the classification of the organizations under the **Second Classification System** (Table 3 above) was retrieved primarily from their official websites. Supplementary information on initiatives and organizations was obtained from projects and companies' websites, official LinkedIn pages, as well as news articles and conference reports when the primary sources were insufficient to provide an accurate classification.

Each case study was approached with the same process. At first, cursory research was done to better understand and characterize each city's smart sustainable city strategy, that is, centralized in a single document/plan, or decentralized in multiple ones. The second step was identifying if there were any dedicated websites for the cities' smart sustainable city agenda with a corresponding list of initiatives. The third step was to expand on the list of initiatives through deeper research through Google's search engine - with terms such as Smart City, Sustainable City, Green City, Urban Development, Sustainability, IoT, ICT, etc. – which led to a final roster when results eventually became saturated and no new initiatives were displayed. The fourth step was cataloging each initiative through the **First** and **Second Classification Systems** by assigning one point for each category of Organization or Specific Domain explicitly¹² related to the initiative, which resulted in the tables in **Annexes A and B**. The fifth and final step was processing and condensing the data in Excel-generated tables and graphs – detailed in the following sections - for a clearer depiction of each city's reality, as opposed to their initial intended strategies, as well as their stand concerning the adapted Dichotomies from Mora et al. (2019).

In terms of the **Second Classification System**, an additional differentiation was made to address the issue of effective citizen participation. Some initiatives are what Cardullo and Kitchen (2019) describe as citizen-focused, consisting in forms of "stewardship and civic paternalism", while realistically representing a non-participation, "because the focus, objectives and solutions were set before problems and suggestions from citizens could be taken into

¹² For the organizations, the point was assigned when the organization was described as responsible or a main partner of the project. For the specific domains, the point was assigned when the specific domain was mentioned as a core objective of the initiative. For instance, an electric mobility initiative that explicitly mentions reduction of CO₂ emissions as one of its targets will be accounted in the Air category, otherwise it will not. The idea is that a non-intended/collateral specific domain which is not subject to any monitoring or measurement by the project's coordinators cannot be reliably included in the classification. In both cases, the information was verified in the project's and/or the organization's website, as well as news articles and reports.

account” (p. 819). If an initiative showed no evidence of citizens being able to actively participate in a project’s decision making and/or there were no representants of the Civil Society to ensure their interests were safeguarded as a collective, no points were assigned and the initiative was marked with a P. Conversely, a point was assigned if the initiative held a member of the Civil Society as responsible or as the main partner, or if there was evidence of active citizen participation outside of a collective organization. In this second case, the initiative was also highlighted in **Annex A**.

Initiatives that involved multiple organizations and/or multiple domains have been accounted for in all relevant categories in order to allow for the effective analyses of Dichotomies 1 (segmented vs holistic approach) and 2 (double or triple/quadruple-helix model of collaboration). The flow of change, Dichotomy 3, was evaluated by examining the projects’ origins and main conductors, through the websites of each initiative and organizations involved, as well as news reports and articles on the projects’ status. For instance, a higher number of initiatives involving the Government, Industry, and Scientific Community collectively, rather than individually or in pairs, implies an overall triple-helix model of collaboration. At the same time, if the Government is involved in a substantial amount of initiatives, that can indicate a preference for a top-down approach, particularly if the initiatives are primarily solo ones.

This methodology allowed for a reliable and systematic review of a city’s smart sustainable city effort at a given point in time. By analyzing its intended strategy (centralized or not) - which often spans multiple years or even decades - and comparing it with the initiatives currently undertaken, conclusions can be drawn about its present smart sustainable city status, as well as conjectures about its future. However, there are limitations as some initiatives can be overlooked due to eventual imperfections with the search engine’s algorithm and/or lack of visibility (i.e. non-divulged individual initiatives or less impactful initiatives led by smaller organizations that never made headlines). Nonetheless, it is a valid and consistent approach for the overall understanding of the analyzed cities’ current configuration regarding the smart sustainable city phenomena, as well as for eventually answering the proposed research questions.

Section IV – Empirical Analysis: Case Studies

Under the proposed methodology, 577 initiatives were analyzed. Their distribution within the classification systems for each of the evaluated cities is further described in the subsections below, as well as registered on **Annex A**. This section begins with the European benchmark cities in order to first test the assumptions concerning the best practices context, then follows with the analyses of the Global South representative city, Rio de Janeiro.

I. Berlin

Berlin is the capital and largest city of Germany, in both population and size. The city covers a surface of 892 km² and in 2018 was responsible for 4,4% of the GDP of Germany, which is 145 billion euros (Eurostat, 2020). Berlin is home to over 3.6 million inhabitants and part of a metropolitan region (Berlin-Brandenburg) of approximately 6 million people (Statistik Berlin Brandenburg, 2018). It is also one of the three “city-states” (*Stadtstaaten*), along with Hamburg and Bremen, among the 16 member states (*Gliedstaaten*) that compose the Federal Republic of Germany. This dual nature essentially grants Berlin comprehensive executive and legislative powers, as the city functions both as a municipal (*Stadt, Gemeinde*) and regional (*Bundesland*) authority (Zvolska, Lehner, Voytenko Palgan, Mont, & Plepys, 2019). Unsurprisingly, this strong public presence in Berlin results in the Government being one of the main protagonists in Berlin’s smart city agenda.

a. Strategy

The city’s smart strategy was established on April 21st, 2015. It emphasizes the role of ICT and Big Data in shaping Berlin’s understanding of a smart city: a sustainable, resilient, energy-efficient, and attractive city, with high standards in terms of quality of life for its citizens (Senatsverwaltung für Stadtentwicklung und Umwelt, 2015). The overall holistic strategy is divided into six main principles or fields of action, further described in **Table 4** below, which guide all the cities’ initiatives:

Table 4*Smart City Principles (Berlin)*

Principle	Description
Smart administration and society	Simplification of administrative processes, transparency, citizen friendliness.
Smart Living	Preservation and development of socially and demographically diverse neighborhoods and districts, and efficient housing.
Smart Business	Cooperation between research institutions, universities, and companies for a more interdisciplinary approach, especially at the interfaces of ICT, energy technology, health, and transport/mobility.
Smart Mobility	Socially equitable, economic, and ecologically designed mobility.
Smart Infrastructure	Harmonization of urban development structures and network infrastructures towards sustainability and carbon-neutrality.
Public Security	Protection against deliberate damage and natural disasters. Data security, integrity, authenticity, and availability.

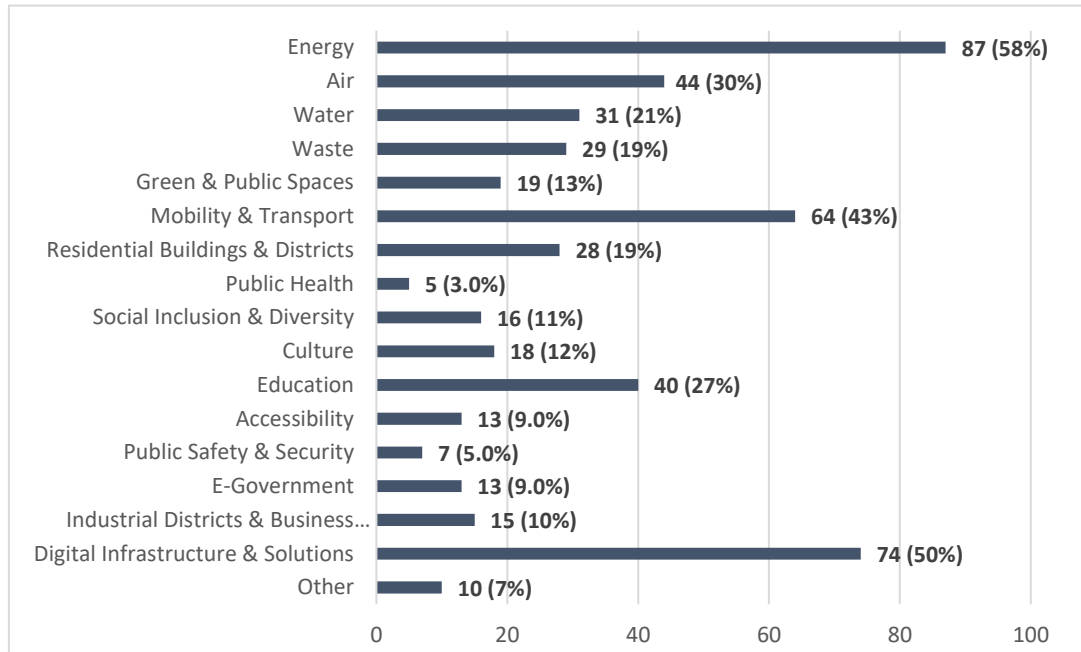
Source: own elaboration based on Smart City Berlin (2019).

b. First classification system

Currently, there are 142 initiatives listed on Berlin's smart city website, as per **Annex A**. Two of those were automatically excluded from the analysis, that is, initiative # 120, as it was discontinued; and initiative # 131 since it was unavailable in either English or German, hindering the gathering of reliable information. Through deeper research into the original 142 initiatives, nine new projects were discovered and included in the final list. The resulting total of 149 initiatives are thus distributed among the first classification system categories (**Table 1** in the Methodology Section):

Figure 1

Initiatives per specific domain (Berlin)



Source: own elaboration.

There is an evident predominance of Energy, Mobility & Transport, and Digital Infrastructure & Solutions related initiatives, which could be explained by multiple factors. Firstly, the three categories are considered primary points within Berlin's Smart City Strategy, with mobility being an autonomous principle by itself and technology an indissociable part of Berlin's understanding of smart cities. Secondly, both the city and the country are committed to climate neutrality by 2050. On a local level, Berlin's Energy Transition Act bindingly dictates that the city must reduce its GHG emissions by 85% to 95% (with reference to 1990 levels) until the aforementioned deadline (Berlin, 2016). On a national and international level, the Climate Action Plan 2050 (CAP) – in accordance with the Paris Agreement – has set long-term tactics for emissions reduction in various sectors, among which stand Transport and Energy¹³ (Bundesministerium für Umwelt Naturschutz und nukleare Sicherheit - BMU, 2016).

The CAP is part of Germany's *Energiewende* (i.e. energy transition) effort, which has since 2010 fueled a nation-wide energy overhaul towards renewable energy sources and carbon neutrality (International Energy Agency - IEA, 2020). Among the *Energiewende* targets, the

¹³ Top GHG emitting sectors alongside the Industry according to the German Environmental Agency (Umweltbundesamt, 2020).

increase of 40 to 45% in the share of renewables in power consumption by 2025, the decommissioning of all nuclear plants by 2022, and the reduction of 55% of GHG emissions by 2030 (from 1990 values) have encouraged the creation of various projects related to electric mobility, renewable energy sources, and energy efficiency throughout Germany and particularly Berlin (Bundesministeriums für Wirtschaft und Energie - BMWi, 2020). Incidentally and due to their highly technical nature, such projects almost always come hand in hand with digital solutions and infrastructure. Berlin's initiative distribution aptly illustrates this connection: out of the 87 Energy initiatives, 46 also involve Mobility and 24 include all three of the previously mentioned categories. Similar observations can be made about the Air category, as 37 out of 43 initiatives are also related to Energy initiatives due to their potential reduction of GHG emissions.

On the other end, Public Health and Public Safety & Security are the categories with the least initiatives associated, representing 3% and 5% of all initiatives, respectively. Their added percentage is equal to the subsequent initiative from bottom to top¹⁴, E-Government (8%), and slightly inferior to the following ones, Accessibility (9%), Social Inclusion & Diversity (11%) and Culture (12%), all part of the Social major domain. The share is more significant in the case of Residential Buildings & Districts (19%), and even more so of Education, the fifth most occurring category with 27% of initiatives. Despite that, the overall distribution indicates an underrepresentation of the Social major domain, as almost half of the initiatives (46%) are not related to any of the eight specific domains.

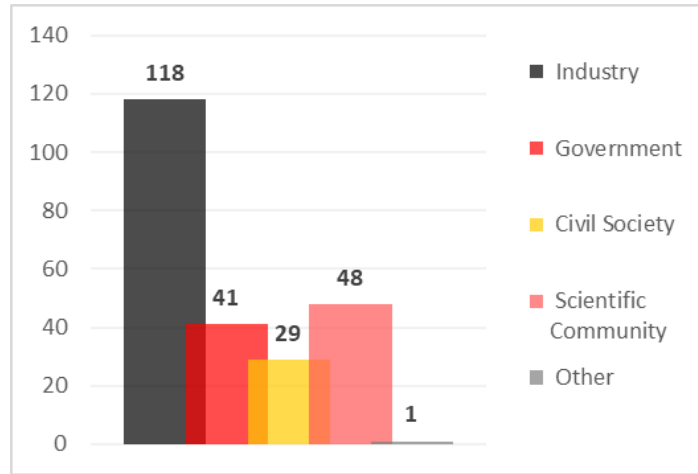
c. Second classification system

The initiatives were carried by 224 organizations, 12 of which are multi-category ones (refer to **Annex B**). More than half of all organizations involved are from the Industry category, which denotes a strong interest from the private sector in actively participating in the city's smart agenda. It is especially so in the case of technology and energy companies, like Siemens and Gasag, as they capitalize on the climate neutrality effort. In addition, Smart Businesses is a pillar of Berlin's strategy, as the city aims to be more business-friendly in order to attract companies and investments. This can be observed by the numerous Industrial Districts & Business Accelerators initiatives around the city, like the Berlin Schöneeweide technological district (Berlin Schöneeweide, s/d).

¹⁴ Apart from the Other category, with 7% of the initiatives.

Figure 2

Organizations per category (Berlin)



Source: own elaboration.

In terms of the second classification system (**Table 2** in the Methodology Section), Berlin's initiatives are divided as such:

Table 5

Initiatives per organization category (Berlin)

No. Agents	No. Initiatives	A	B	C	D	E
		Industry	Government	Civil Society	Scientific Community	Other
1	68	24 (35%)	25 (37%)	15 (22%)	4 (6%)	0
2	37	22 (59%)	28 (76%)	11 (30%)	12 (32%)	1 (3%)
3	34	33 (97%)	33 (97%)	3 (3%)	33 (97%)	0
4	10	10 (100%)	10 (100%)	10 (100%)	10 (100%)	0
Total:	149	89 (60%)	96 (64%)	39¹⁵ (26%)	59 (40%)	1 (1%)

Source: own elaboration.

It is important to clarify that more than half of the initiatives, namely 81, involve multiple organizations, which results in the overlaps observed in **Table 5** above. Out of these multi-agent initiatives, 37 include two agents, 34 include three agents and 10 include all the major four. The solo initiatives are largely undertaken by the Government (25) and Industry (24), followed by the Civil Society (15) and Scientific Community (4).

¹⁵ Additionally, there are eight initiatives in which the Civil Society is a mere participant (marked with a "P" in the **Annex A**).

That being said, it can be affirmed that Berlin's smart sustainable city strategy almost evenly favors individual initiatives and double/triple-helix models of collaboration – primarily involving Industry, Government, and Scientific Community -, while sparingly adopting quadruple-helix models in order to include the underrepresented Civil Society.

Concretely, citizen participation in Smart City Berlin relies heavily on mobile applications, voluntary participation, and passive data gathering when concerning individuals, while being more diverse when involving collectivities, such as Foundations, Associations, and NGOs. Essentially, most of the initiatives which involve citizens fall under two main categories: sharing economy initiatives, such as shared bikes or cars and communal gardens (e.g. Friendly Berlin¹⁶, Summer Fleet¹⁷, Flotte-Berlin¹⁸); and informative or educational initiatives, such as those related to events and cultural happenings, smart city/technology showrooms or workshops, alerts and warnings on public safety or health, and utility services locations (e.g. CityLAB¹⁹, KATWARN²⁰, BSR-App²¹). A significant number of Berlin's initiatives are examples of the aforementioned citizen-focused initiatives, as described by Cardullo and Kitchin (2019), as often citizens are treated only as data sources or service users, without any active voice in the project's structuring and decision-making.

There are, however, exceptions such as the Green Moabit initiative to create a smart sustainable neighborhood, which established an exchange with the concerned community since its drawing board (Climate-KIC, s/d). The project also strives to maintain a continuous report with the citizens and has thus been successful in anticipating their needs and resolving arising issues accordingly. Similarly, *Mein Berlin* is citizen participation par excellence, as its platform allows for Berliners to comment, discuss, and propose existing and future projects around the city (Land Berlin, s/d).

Contrary to what its original strategy suggests, overall Berlin's initiatives are far from holistic. There is an evident partiality towards environmental and technological projects, led by Energy, Mobility & Transport and Digital Infrastructure & Solutions initiatives. The more social aspects of urban development are poorly represented, which could be a consequence of the modest participation of the Civil Society, arguably the most interested party in the subject.

¹⁶ Friendly Berlin (2020).

¹⁷ Neue Mobilität Berlin (2019).

¹⁸ ADFC Berlin (s/d).

¹⁹ CityLAB Berlin (s/d).

²⁰ KATWARN (s/d).

²¹ BSR (2020).

II. Copenhagen

Similar to Berlin, Copenhagen is the capital and most populous city of Denmark with 623.500 inhabitants in 2019 (Københavns Kommune, 2020b). The city is likewise part of a larger metropolitan region called Greater Copenhagen, with more than 1.3 million residents as of 2019, and an even larger administrative region named Hovedstaden, or the Capital Region, with almost 2 million inhabitants and comprised of 28 municipalities (Danmarks Statistik, 2020). Although the region is one of the smallest in Denmark, with only 2.560 km² (6% of the Danish territory), in 2018 the Hovedstaden was responsible for 40.5% of Denmark's GDP, that is 122 billion euros (Eurostat, 2020).

a. Strategy

The city of Copenhagen chose a different path to achieve its smart sustainable city objectives. Unlike Berlin, Copenhagen does not have an integrated smart city strategy or policy. Instead, the city opted for creating specific plans and policies for each of the aspects it considers relevant to its urban development standards, such as the CPH 2025 Climate Plan, the Bicycle Support Priority Plan 2025, the Green Mobility Action Plan, and the Circular Copenhagen Resource and Waste Plan 2024, to name a few (Københavns Kommune, 2012b, 2012c, 2017a, 2019). Each plan has its principles, targets, and oftentimes general projects (e.g. increasing the percentage of commuters who cycle to work or education to 50% by 2025). These policies are not necessarily labeled as smart, but in essence, they're the backbone of Copenhagen's benchmark smart city status.

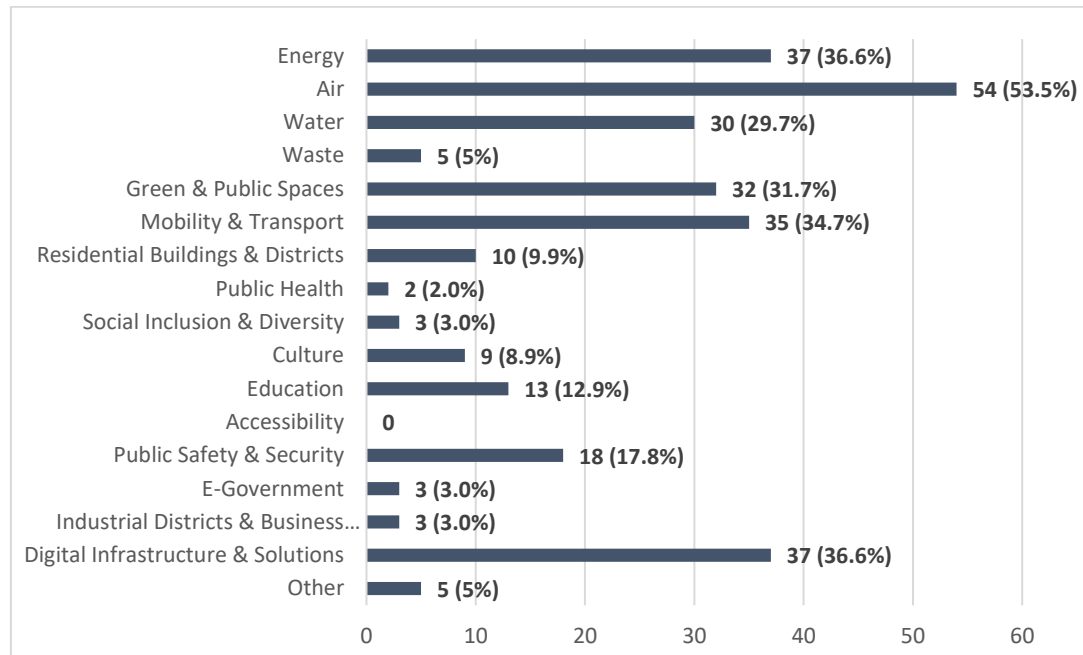
The website dedicated to the city's urban development is concise. It emphasizes the importance of climate, livability, mobility, urban development, and technology in promoting quality of life, economic growth, and the development of a green, smart, vibrant, and responsible city (Urban Development CPH, s/d). The portal describes a limited amount of initiatives, choosing to portray the underlying plans. Therefore, Copenhagen's list of initiatives was created through multiple sources, as explained in the Methodology section, with highlights to the city's official website and the Copenhagen Solutions Lab portal (Copenhagen Solutions Lab, 2020; Københavns Kommune, s/d-b).

b. First classification system

Copenhagen's 101 initiatives are thus divided by the first classification system (**Table 1** in the Methodology Section):

Figure 3

Initiatives per specific domain (Copenhagen)



Source: own elaboration.

Almost two-thirds of all the analyzed initiatives from Copenhagen are related to either Air or Energy, which, similarly to Berlin, may be explained by local, national, and international factors. On an international level, Denmark must achieve the European Union (EU) targets of a 40% reduction in greenhouse gas emissions, compared to 1990 base levels, and a 27% share of renewables within the energy sector by 2030. From a national standpoint, the country strives to reach higher targets: a 50% share of renewables by 2030 and a net-zero emission by 2050 (Danish Ministry of Climate Energy and Utilities, s/d). Going even further, the city of Copenhagen has set the even more ambitious goal of being the first carbon-neutral capital by 2025, as part of its aforementioned ten-year Climate Plan (Københavns Kommune, 2012b).

The city has almost as many initiatives involving Air and Energy as it does Air and Green & Public Spaces, 29 and 26 respectively²². There are also 19 initiatives that include Mobility & Transport, Air, and Energy, among other domains. Considering this initiative distribution, it can be argued that Copenhagen opted for a dual approach for achieving its climate targets: carbon sequestration, by increasing the number of trees, parks, and green spaces; and energy transition, by ensuring the generation and use of cleaner energy sources, especially in the transport sector.

²² Among other domains, while five of which involve all three (Air, Green and Public Spaces, and Energy).

This argument is supported by the city's Climate Plan, as Mobility, cleaner Energy Production and Consumption, and City Administration Initiatives (e.g. expanding and improving public green spaces) are considered the main pillars of action.

Another observable trend is the strength of Denmark's cycling culture, a tradition that has been cultivated for over 100 years. Currently, 9 out of 10 Danes own a bike and cycle, on average, 1.6 km a day (Ministry of Foreign Affairs of Denmark, s/d). Similarly, Copenhagen is an award-winning city of cyclists, frequently selected as the world's best cycling city and with a city-cycling ranking system named after the city itself, the Copenhagenize Index (Astrup, 2019; Copenhagenize, 2019). This cultural characteristic translates to the initiatives, as 12 out of the 35 mobility initiatives are related to cycling.

The Social major domain is once more underrepresented, as more than half of the initiatives (57%) are not related to any of the social specific domains. Almost 1/3 of all Social initiatives are related to Public Safety & Security, all of which are also related to Water. The reasoning behind it is that Copenhagen perceives hydric stress (e.g. storm and sea floods) as the primary climate challenge to be faced by the city in the upcoming decades. To address this risk, the city proposed two specific plans, the 2012 Cloudburst Management Plan and the 2017 Stormflood Plan, which guide the city on matters such as construction and management of waste-water and sewer systems, drainage routes, Sustainable Urban Drainage Systems (SUDS)²³, etc. (Københavns Kommune, 2012a, 2017b). That being said, most of Copenhagen's Public Safety & Security related initiatives are forms of SUDS (14 out of 18), perceivable by the overlapping of Water and Green and Public Spaces initiatives with the Public Safety and Security ones.

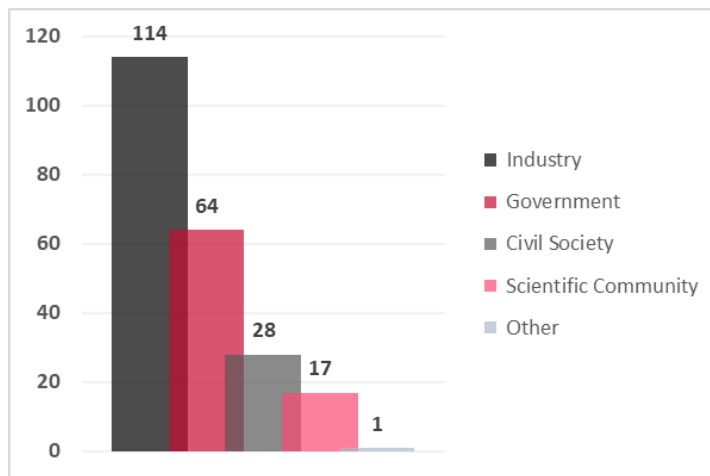
c. Second classification system

There are 215 organizations involved in Copenhagen's initiatives, six of which are multi-category (refer to Annex B). There is an expressive number of agents from the Industry and Government, which seems to imply a top-down approach.

²³ Series of techniques designed to reduce surface runoff by increasing water permeability by natural means, for instance, through rain gardens and green roofs (State of Green, 2016).

Figure 4

Organizations by category (Copenhagen)



Source: own elaboration.

In terms of the second classification system (**Table 2** in the Methodology Section), Copenhagen's initiatives are divided as such:

Table 6

Initiatives per organization category (Copenhagen)

No. Agents	No. Initiatives	A	B	C	D	E
		Industry	Government	Civil Society	Scientific Community	Other
1	33	1 (3%)	31 (94%)	1 (3%)	0	0
2	35	27 (77%)	33 (94%)	9 (26%)	1 (3%)	0
3	27	27 (100%)	27 (100%)	12 (44%)	14 (52%)	1 (4%)
4	6	6 (100%)	6 (100%)	6 (100%)	6 (100%)	0
Total:	101	61 (60%)	97 (96%)	28²⁴ (28%)	21 (40%)	1 (1%)

Source: own elaboration.

More than half of all initiatives involve multiple agents, namely 68, which results in the overlap observed in **Table 6** above. Out of these multi-agent initiatives, 36 involve 2 agents, 27 involve 3 agents and 6 involve all major four. The Government is part of 96% of the initiatives and is responsible for almost all individual initiatives (31), while the Industry and Civil Society are each responsible for 1. In this respect, it can be affirmed that Copenhagen has established a

²⁴ Additionally, there are nine initiatives in which the Civil Society is a mere participant (marked with a "P" in the Annex A).

strong top-down approach to its urban development, while evenly opting for a single or double/triple-helix model of collaboration.

The Civil Society category is once again underrepresented. However, Copenhagen's initiatives have a distinct citizen proactiveness quality. For instance, the *Fremtidens Gårdhave* (Courtyards of the Future) initiatives established a close connection with Copenhagen's citizens through continuous dialog. The *Straussvej* Courtyard²⁵, especially, opted for a form of innovative collaboration with the community, consultancies, public agents, and HOFOR (i.e. Copenhagen's main utility company). Since the initiative's beginning, the *Læg og Læringsworkshoppen* (Play and Learn workshop) allowed citizens to contribute with their knowledge, present their demands and suggestions, and ultimately influence the decisions on the project. Additionally, comprehensive initiatives like Co-Create Copenhagen²⁶ and Sharing Copenhagen²⁷ have the potential to generate innumerable projects around the city which, however, might operate under the radar of official reports.

²⁵ Klimakvarter (s/d).

²⁶ Københavns Kommune (s/d-a).

²⁷ Københavns Kommune (2020a).

III. Lisbon

The city of Lisbon is the capital and most populous city of Portugal, with over 506.600 inhabitants in 2018 (Pordata, 2019). The city is also part of a larger metropolitan region, home to 2,833,679 million people, which accounts for almost 1/3 of Portugal's entire population. The metropolis is characterized by a high populational density (933 inh/km²) and a predominance of economic activities based on the tertiary sector, corresponding to 86,6% of the regional gross value added in 2017 (European Commission, s/d-a). It is also Portugal's commercial and financial center, with a GDP of 73 billion euros, corresponding to 36% of the country's total in 2018 (Eurostat, 2020).

a. Strategy

Although not specifically labeled as smart or sustainable, Lisbon has approved on November 19th, 2019, a plan entitled *Grandes Opções do Plano 2020-2023*, or the Plan's Grand Options in a free translation (Câmara Municipal de Lisboa, 2019b). Similar to Berlin, the Plan holistically guides Lisbon's initiatives, defining major and specific areas of concern, while also describing and assessing concluded, ongoing and intended measures. The strategy is divided into 6 Axes, which are then further subdivided as such:

Table 7

Municipal Guidelines 2020/2023 (Lisbon)

Axes	Sub-axis	Description
A. Improve quality of life and environment	A1. Housing for all.	A sustainable and welfare city committed to the permanent improvement of the urban environment and quality of life.
	A2. Planned and rehabilitated city.	
	A3. Accessible mobility for all.	
	A4. Sustainable, resilient, and environmentally friendly city.	
	A5. More and better public spaces.	
	A6. Safe city.	
B. Fight exclusions, defend Rights	B1. Affirm rights, strengthen citizenship.	A city of citizenship for all, that fights exclusions and defends rights, promoting their universal access.
	B2. Education, qualification, schools.	
	B3. Sport and physical activities.	
	B4. Health and quality of life.	

Axes	Sub-axis	Description
C. Empower the economy	C1. Qualified services and jobs.	A city of shared prosperity, which powers the economy and employment.
	C2. Entrepreneurs and entrepreneurship.	
	C3. Promote talent.	
	C4. Smart City.	
	C5. Proximity commerce.	
D. Establish Lisbon as a global city	D1. City of culture and openness.	A progressive and universal city, which welcomes and develops the multiple aspects of culture and asserts itself as a global city
	D2. Creative city.	
	D3. Atlantic capital.	
E. Open, decentralized, and participatory governance	E1. Transparency and accountability.	A city of participation and democracy, which practices a governance that is open, transparent, efficient, and decentralized.
	E2. Effectiveness, efficiency, and professionalism.	
	E3. Citizen participation.	

Source: own elaboration based on *Grandes Opções do Plano 2020-2023* (Câmara Municipal de Lisboa, 2019b)

Each axis and sub-axis have their own assigned budget for the triennium (2020-2023), totaling 1.649.575 thousand euros. Axis **A** represents the largest share of the investment, 1.233.201 thousand euros (74,8%), followed by Axes **B** (13,5%), **E** (8,4%), **D** (1,9%), and **C** (1,5%). The sub-axes with the highest planned investments are **A4.** Sustainable, resilient, and environmental-friendly city (21,2%); **A2.** Planned and rehabilitated city (21,1%); and **A1.** Housing for all (17,6%). For comparison, the investment on **C4.** Smart City (744 thousand euros) does not even account for 1% of the total investment. That being said, Lisbon's municipal strategy bets heavily on the environmental aspects of urban planning, followed closely by social ones, particularly when concerning affordable housing. This preference can be explained by the city's strategic re-positioning as a green capital in the last decade, that culminated in Lisbon being chosen as Europe's Green Capital of 2020 (Câmara Municipal de Lisboa, 2018).

b. First classification system

Currently, Lisbon's smart city website lists 35 smart city initiatives (Câmara Municipal de Lisboa, 2020). Through deeper research from a wide range of sources, such as the city's new official website²⁸, news articles²⁹, and non-profit organizations websites³⁰, 79 additional

²⁸ Câmara Municipal de Lisboa (s/d-a).

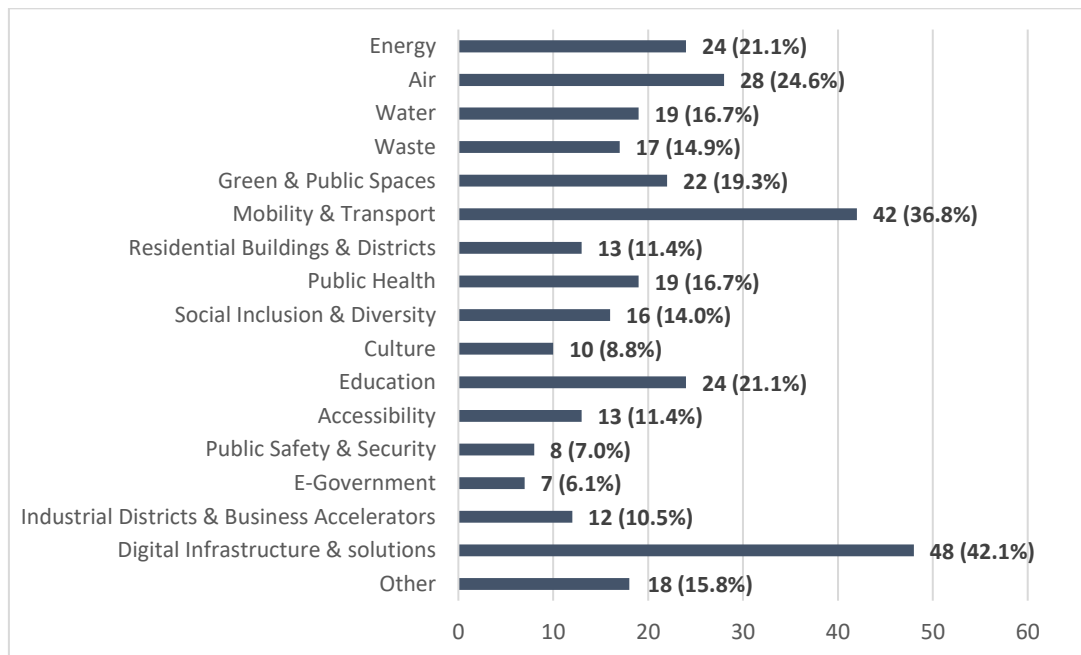
²⁹ Revista Smart Cities (s/d).

³⁰ iLisboa E-Nova (2019).

initiatives were found and cataloged. The resulting total of 114 initiatives are thus distributed by the first classification system (**Table 1** in the Methodology Section):

Figure 5

Initiatives per specific domain (Lisbon)



Source: own elaboration.

Despite the sub-axis **C4. Smart City** – arguably the one more closely related to technology - being one of the subdivisions with the least amount of investment allocated by the Plan, the city's initiatives distribution portrays otherwise as 42.1% of the initiatives are related to the Digital Infrastructure & Solutions category. Additionally, of the 48 initiatives on said category, 46 have Government participation. This leads to the conclusion that, although poorly contemplated by the municipal Plan, technology – particularly ICT, IoT, and Big Data - is indeed a substantial part of Lisbon's smart sustainable city agenda. The correlation between this specific domain and those of Energy, Air, and Mobility & Transport is also observable, as 16 initiatives also include Energy and/or Air and 19 also include Mobility & Transport, while 10 include all four.

Moreover, the second most present specific domain, Mobility & Transport, has an interesting connection with Green & Public Spaces, as 14 initiatives belong to both specific domains. It can be argued that Lisbon's strategy to improve public spaces (**A5.**) and to provide accessible mobility to all of its citizens (**A3.**) have merged into initiatives that purposely renovate

or adapt public spaces in order to create more accessible transport solutions, often in the form of improved public transports and bicycle lanes. That is the case with the ongoing renovation of the *Praça de Espanha*, which aims to create a green space for citizens to enjoy, while at the same time optimizing previous public transport routes and creating additional bicycle paths (Câmara Municipal de Lisboa, s/d-c).

In terms of major domains, Lisbon's initiatives are relatively evenly distributed as 61% include at least one Environmental specific domain, 60% at least one Social specific domain, and 48% at least one Economic specific domain. The same can be said about the specific domains, with the exception of Digital Infrastructure & Solutions and Mobility & Transport which stand out as the most interconnected and frequent categories.

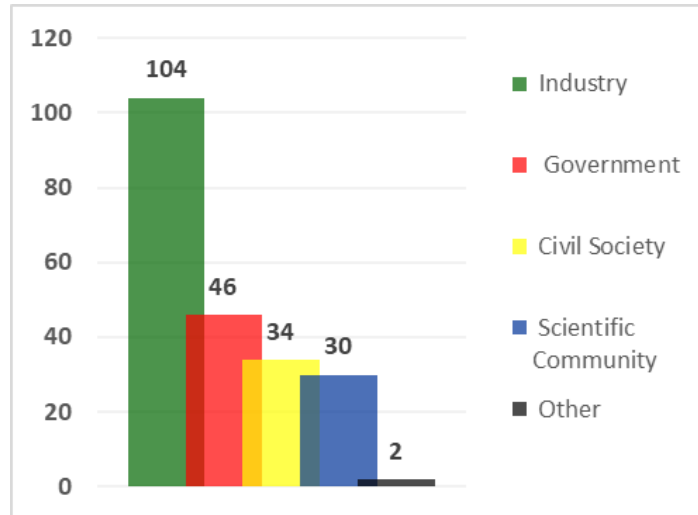
Education is once more a relevant specific domain, as it is the fifth most present category overall and the one with the most initiatives within the social domain, followed by Public Health. This resonates with the city's Plan, as the related sub-axes (**B2.** and **B4.**) are the ones with the highest allocated funds within the distinctly social **B.** Axis (refer to **Table 7** above).

c. Second classification system

The initiatives were carried out by 199 organizations, 10 of which are multi-category ones (refer to **Annex B**). The Industry is once more predominant in terms of an absolute number of organizations (**Figure 6**), mainly through those of the energy, technology, and shared-mobility services sectors (i.e. EDP, Siemens, Hive). There is also a substantial number of organizations from the Civil Society, which influences the initiatives' distribution observed in **Table 8** below.

Figure 6

Organizations per category (Lisbon)



Source: own elaboration.

In terms of the second classification system (**Table 2** in the Methodology Section), Lisbon's initiatives are divided as such:

Table 8

Initiatives per organization category (Lisbon)

No. Agents	No. Initiatives	A	B	C	D	E
		Industry	Government	Civil Society	Scientific Community	Other
1	52	2 (4%)	45 (87%)	5 (10%)	0	0
2	39	17 (43%)	37 (95%)	19 (49%)	4 (8%)	1 (3%)
3	15	14 (93%)	15 (100%)	11 (73%)	4 (27%)	1 (6%)
4	8	8 (100%)	8 (100%)	8 (100%)	8 (100%)	0
Total:	114	40 (35%)	105 (92%)	43³¹ (38%)	14 (12%)	2 (2%)

Source: own elaboration.

More than half of all initiatives involve multiple agents, namely 62, which results in the overlap observed in **Table 8** above. Out of these multi-agent initiatives, 39 involve 2 agents, 15 involve 3 agents and 8 involve all major four. The Government is part of 92% of all initiatives and responsible for 87% of the individual ones, while Industry and Civil Society are responsible for 4% and 10%, respectively. Despite being a less representative category in terms of its overall

³¹ Additionally, there are 12 initiatives in which the Civil Society is a mere participant (marked with a "P" in the Annex A).

number of organizations, Lisbon has a high percentage of initiatives individually or collectively led by the Civil Society, greater even than the ones taken by the Industry. This reinforces the argument for the social nature of Lisbon's smart sustainable city agenda, and it can be distinctly observed in initiatives such as *Lisboa Participa* and the Bip/Zip Program (Câmara Municipal de Lisboa, 2019a, s/d-b). The first initiative is an online portal where citizens can actively participate in the city's projects, propose ideas, and even decide about a parcel of the city's budget (i.e. *Orçamento Participativo*). The second initiative annually integrates projects and promotes local partnerships submitted by citizens and local communities in Priority Intervention Neighborhoods and Zones around the city.

However, there is little evidence of consistent integration with the Scientific Community, as only 12% of the initiatives include this category. This presents a contradiction with the city's initial strategy of promoting entrepreneurship and innovation, as many scholars argue that the inclusion of the Scientific Community, in triple or quadruple-helix models of collaboration, is arguably the main driver for innovation and new paths for economic development (Etzkowitz & Leydesdorff, 2000; Galvão, Mascarenhas, Gouveia Rodrigues, Marques, & Leal, 2017; Mora et al., 2019). Overall, it can be affirmed that Lisbon has established a strong top-down approach to its urban development strategy, although there is an effort for increasing citizen participation towards a combined bottom-up/top-down approach. The city also evenly opts for a single or double/triple-helix model of collaboration, where the Civil Society more often plays the role of the third helix, as opposed to the more traditional Scientific Community.

IV. London

The Greater London, generally known as London, is the capital and most populous city of England and the United Kingdom (UK), with almost 9 million estimated inhabitants in 2019 (Office for National Statistics, 2020a). In terms of the administrative geography, London is given the same hierarchy as a Region (i.e. South East, North West, East, etc.), being governed by the Greater London Authority (GLA) which is led by the Mayor of London (Zvolska et al., 2019). The metropolis is comprised of 32 boroughs plus the City of London, 13 of which constitute the Inner London and 20 the Outer London. Although technically a council and not a borough, the City of London - also known as the Square Mile - is the smallest of the Inner London districts: its boundaries roughly correspond to the original Roman settlement established almost 2 millennia ago and it is home to only 9.721 inhabitants (City of London, 2019).

London is a true powerhouse in terms of financial capacity. In 2018, the city's GDP was approximately 572 billion euros, corresponding to 24% of the country's total volume and even surpassing Portugal's and Denmark's combined GDP (Eurostat, 2020; Office for National Statistics, 2020b). Moreover, the city has the highest GDP per capita in the UK and also among the other European cities. Likewise, London is the headquarter of most of the UK's top companies and more than 100 of Europe's 500 largest companies (European Commission, s/d-b).

a. Strategy

The city's current smart sustainable city strategy was built on the Smart London strategy of 2013 and its 2016 revision, which denotes almost a decade of institutional commitment to the smart city agenda. After an extensive participation process, with over 80 meetings and events with representatives of the tech sector, communities, universities, Councils, and civil society, in June 2018 the GLA published London's new strategy, aptly named Smarter Together London Roadmap (Greater London Authority, 2018c). The Roadmap is a non-statutory document (i.e. a text not submitted to legislative process), intended to be a flexible digital masterplan and complementary to the seven statutory Mayoral strategies³². The document is divided into five missions, described as follow:

³² The seven statutory strategies are: transport, environment, health inequalities, housing, culture, economic development, and the London Plan. The current London Plan was elaborated in 2011 and consolidated with alterations in 2016. However, there is a draft for a New London Plan, which should follow to publication in 2020.

Table 9*Smarter London Together Missions*

Missions	Description
1. More user-designed services	Respect diversity and the citizen's needs when developing new digital services and promoting digital inclusion and civic participation.
2. Strike a new deal for city data	Devise better policies and strategies concerning data rights, accountability, and trust, as well as cybersecurity.
3. World-class connectivity and smarter streets	Promote better and broader internet connectivity for users and sensors around the city, coordinating public and private investment, for smarter places and homes.
4. Enhance digital leadership and skills	Develop digital capability and invest on the digital workers of the future
5. Improve city-wide collaboration	Improve digital collaboration and sharing between London's 33 local authorities and City Hall, as well as with the private sector (start-ups, tech companies) and other cities.

Source: own elaboration based on Greater London Authority (2018c)

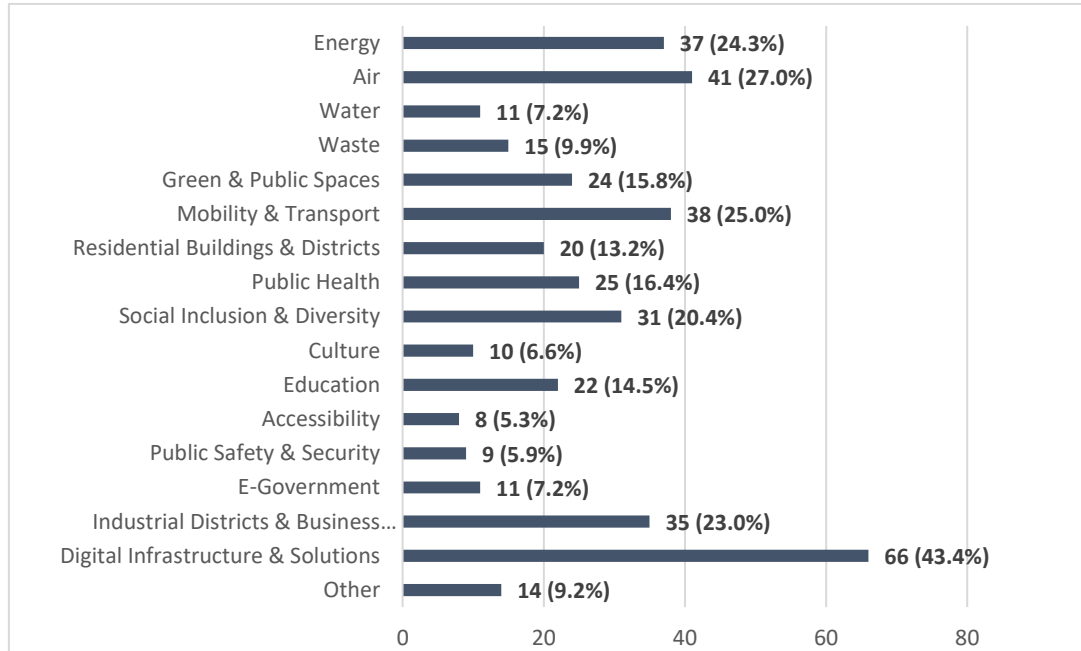
Unlike Berlin, where the centralized smart sustainable city strategy coordinated different aspects of the city's urban development (i.e. mobility, living, businesses, etc.), London's Roadmap, albeit equally centralized, is restricted to goals of a technological nature, particularly data security, digital inclusion, user-centric design, and connectivity. For effect, the Smart Together London Roadmap sets the tone of London's smart sustainable city perspective as a technocentric one, further observable by its initiative distribution analyzed below. In addition, the statutory strategies reflect this ideal, as they refer to the roadmap and the importance of smartness and digitization. For instance, Smart Digital City is one of the strategic approaches of the Environment Strategy, which is described as a "digital first" approach to solving the city's environmental challenges (Greater London Authority, 2018a, p. 34)

b. First classification system

The Roadmap's missions are monitored and constantly updated on a public online report card system, which describes 34 initiatives (Smart London, 2020). Further research through the process described in the Methodology section allowed for the inclusion of 118 additional initiatives. The resulting 152 initiatives are thus distributed under the first classification system (**Table 1** in the Methodology Section):

Figure 7

Initiatives per specific domain (London)



Source: own elaboration.

Similar to Berlin and Lisbon, there is a predominance of Digital Infrastructure & Solutions initiatives, which reflects the aforementioned technocentric smart city perspective adopted by London's strategy. There is also an observable correlation between this specific domain and the Industrial Districts & Business Accelerators one, as more than half of the initiatives of the latter (16) are also related to the former. This is a direct consequence of the city's strategy of supporting collaboration through tech districts and startup accelerators (e.g. Techinvest Programme³³ and Tech London initiatives³⁴) and creating a digitally integrated workforce and environment (e.g. Digital Talent Programme³⁵ and Create Jobs London³⁶ initiatives). Not surprisingly, since the roadmap was published in 2018, London has almost doubled its investment in technology companies from 5.2 billion pounds to 9.5 billion pounds in 2019, according to a report from Tech Nation (2020) on the top 10 European cities that invest in technology companies, the first one being London itself. For comparison, in the same

³³ Tech Invest (s/d).

³⁴ Tech London (s/d).

³⁵ Greater London Authority (2020a).

³⁶ A New Direction (2020).

year the investment done by the second and third cities in the rank, Berlin and Paris, was 4.5 and 3.2 billion pounds, respectively.

Likewise, the connection between Digital Infrastructure & Solutions and certain environmental categories is once again present. The second and fourth most present specific domains – Air and Energy - each have 15 initiatives that are also under the Digital Infrastructure & Solutions category, and the third one, Mobility & Transport, has 16. Similar to the cities previously analyzed, this can be partially explained by multiple factors. One is the previously mentioned “Digital First” approach proposed within the London’s Environment strategy, which aims to give technological solutions to environmental problems. The other is London’s - and most recently in 2019, the United Kingdom’s – commitment to a net-zero GHG emission by 2050 (Greater London Authority, 2018a; Walker, Mason, & Carrington, 2019).

In London’s case, the effort to reduce emissions translated primarily to clean, energy-efficient, and sustainable mobility initiatives. Such is the case with the Low and Ultra Low Emission Zones³⁷, designated areas where only low or zero-emissions vehicles can transit without being charged a fee, and the Healthy Streets Programme³⁸, a toolkit for designing streets that are green, accessible, walkable, cyclable and public transport friendly. In this sense, London’s statutory Transport Strategy proposes that by 2041, 80% of all trips will be made by foot, cycle, or public transport and that 70% of Londoners will live within 400 meters of a cycle route (Greater London Authority, 2018b).

In terms of the Social major domain, Social Inclusion & Diversity, and Public Health are the categories with the most associated initiatives, followed closely by Education and Residential Buildings & Districts. This initiative distribution reflects London’s wealth inequalities³⁹ and the city’s corresponding efforts to balance the scales. This is perceivable by the multiple social initiatives directed to low-income Londoners and those of black, Asian, and minority ethnic group ascendance, the so-called BAME demographic. That is the case of initiatives related to skills acquisition and employment, such as the Digital Talent Programme⁴⁰ and the Mayor’s Construction Academy⁴¹; those that concern affordable energy and homes,

³⁷ Transport for London (s/d-a, s/d-b).

³⁸ Transport for London (2017).

³⁹ In 2017/2018, 28% of Londoners lived in households in poverty and in 2016/2018, 42.5% of all wealth in London was owned by the top 10% people with the highest wealth (Trust for London, s/d).

⁴⁰ Greater London Authority (2020a).

⁴¹ Greater London Authority (2020c).

such as the London Power⁴² and the Homes for Londoners⁴³; and those that directly fight food poverty and income inequalities, such as the FoodCycle⁴⁴ and the London Living Wage⁴⁵.

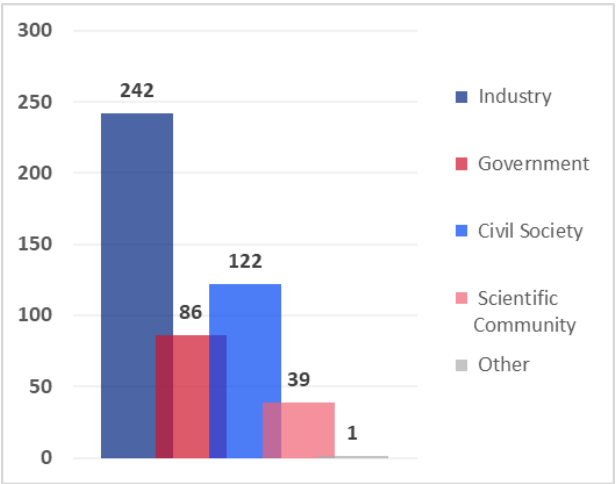
Regarding the major domains, London’s initiatives are to some extent balanced, with 55% of them involving at least one Environmental specific domain, 59% at least one social specific domain, and 56% at least one economic specific domain. However as mentioned previously, the specific domains are substantially populated by technological initiatives, with some intermediate environmental and social categories (i.e. Air, Energy, and Social Inclusion and Diversity) and several underrepresented ones, particularly from the social domain (i.e. Accessibility, Public Safety & Security, and Culture).

c. Second classification system

The initiatives were carried out by 451 organizations, 21 of which are multicategory ones (refer to **Annex B**). Out of all cities analyzed, London is the one with the highest number of organizations involved in total as well as per initiative, with a ratio of almost 3 to 1. The city’s mission of promoting collaboration with multiple agents from public, private, and civil society sectors, described in the Roadmap, as well as its strong economy and business-friendly environment, are some of the factors that could explain this phenomenon.

Figure 8

Organizations by category (London)



Source: own elaboration.

⁴² London Power (s/d).
⁴³ Greater London Authority (2020b).
⁴⁴ FoodCycle (2020).
⁴⁵ Living Wage Foundation (s/d).

The Industry is once more a predominant category, particularly through technology and energy companies, representing more than half of the organizations analyzed. There is also a significant number of Civil Society organizations involved, more than a quarter of the total, which are primarily charities and trust funds. Comparatively, the Scientific Community is underrepresented, as was the case for Copenhagen and Lisbon. This reflects on the initiatives distribution in terms of the second classification system (**Table 2** in the Methodology Section), as observed below:

Table 10

Initiatives per organization category (London)

No. Agents	No. Initiatives	A	B	C	D	E
		Industry	Government	Civil Society	Scientific Community	Other
1	47	1 (2%)	43 (91%)	3 (6%)	0	0
2	59	23 (39%)	55 (93%)	36 (61%)	4 (7%)	0
3	28	27 (96%)	28 (100%)	19 (68%)	10 (36%)	0
4	18	18 (100%)	18 (100%)	18 (100%)	17 (94%)	1 (6%)
Total:	152	69 (45%)	144 (95%)	76⁴⁶ (50%)	31 (20%)	1 (1%)

Source: own elaboration

More than 2/3 of all initiatives involve multiple agents, namely 105, which results in the overlap observed in **Table 10** above. Out of these multi-agent initiatives, 59 involve two agents (56%), 28 involve three agents (26%) and 17 involve all major four (17%). The Government is part of 95% of all initiatives and responsible for 91% of individual ones, with the remaining solo initiatives being divided between Industry (2%) and Civil Society (6%). There is a significant amount of bilateral partnerships in general, and between the Government and Civil Society/Industry in specific, with fewer initiatives being promoted under triple or quadruple helix models of collaboration.

Half of all initiatives include the Civil Society either individually, as citizens, or collectively, as Charities, Funds, and Associations. Out of those, 31 initiatives stand out as examples of active citizen participation, as mentioned in the Methodology Section. For instance, the Crowdfund London initiative that funds community-led projects and creates a channel for individuals to donate and participate in each project, and the Talk London initiative, a citizen

⁴⁶ Additionally, there are 2 initiatives in which the Civil Society is a mere participant (marked with a “P” in the Annex A).

participation portal where Londoners can give their opinion on the city's issues and help shape the city's policies (Greater London Authority, 2020d; Spacehive, 2020).

In sum, London's smart sustainable city profile, although strategically centralized, is by no means holistic. On the contrary, it is one of the most technocentric ones, in both its document format as well as in its initiative distribution. Despite the predominant Government participation, there is a considerable amount of initiatives originated from the civil society, albeit often funded by the Government, which indicates a shift towards a mix of top-down and bottom-up approaches. As for models of collaboration, double and triple/quadruple helix ones are prevalent in London, as opposed to individually led initiatives.

V. Rio de Janeiro

Rio de Janeiro is Brazil's second largest and second richest metropolis, home to an estimated 6,7 million people in 2019 (IBGE, 2019). Like the previously mentioned cities, Rio is part of a larger metropolitan region comprised of 22 municipalities, the so-called *Grande Rio* (i.e. Big Rio), with an estimated 13 million inhabitants in 2019. In 2017, the city's GDP was approximately 337 billion BRL, or around 93 billion euros⁴⁷, representing half of the homonymous Estate of Rio de Janeiro's GDP – or 74% if considered the metropolitan region – and 5% of Brazil's GDP (CEPERJ, 2017). Consequently, the interests of the Estate of Rio de Janeiro (ERJ) and the City of Rio de Janeiro (Rio) are often overlapped, as the economy of the latter heavily influences the former.

In terms of economic profile, Rio's economy revolves mainly around the tertiary sector, which is responsible for 52% of its GDP, followed by the industry at 12% (FIRJAN, 2018). The city, which was the country's capital before it was replaced by the planned city of Brasilia in 1960, is located in a coastal area that has served to shape Rio's beach-culture and its international image as a tropical touristic destination. The geographic positioning also explains one of Rio's primary industrial activities, oil & gas, as there are many underwater reserves along the ERJ's coastline, particularly in the areas of *Bacia de Campos* and *Bacia de Santos* (Bretas, Laureano, Quintanilha, & Nazareth, 2020). Historically, this translated into a fiscal dependency of Rio, as well as of the ERJ and its other municipalities, to the royalties obtained from oil exploration and refining. This dependency varies in degree from municipality to municipality, as some, like Rio, have other counterbalancing sources of income, such as commerce and services, tourism, and automotive industries, to name a few. Nonetheless, this industry remains an important revenue source and an expected budgetary allocation⁴⁸, meaning that oil crises and price fluctuations tend to impact the ERJ and its municipalities more significantly than others.

In the last decade, the regulatory environment concerning the oil and gas royalties' allocation has become increasingly uncertain, particularly after the announcement of the vast Pré-Sal⁴⁹ reserves in 2010. Since then, non-oil-producing states and municipalities have lobbied for a new regulation on the distribution of royalties under the argument that oil and gas are national resources and as such should be distributed evenly among all Federative Entities (Bretas

⁴⁷ Based on the BRL to Euro average conversion rates in 2017 from the European Central Bank (s/d).

⁴⁸ In 2018, the State of Rio's municipalities earned 12% of their total revenues through to oil and gas royalties and special participations (Bretas et al., 2020).

⁴⁹ Name given to the offshore oil and gas reserves located deep underground, below a salt layer of almost 2 kilometers (Petrobras, 2020).

et al., 2020). In this sense, a new regulation was approved by Congress in 2012 (i.e. Lei nº 12.734/2012), but its effects were suspended in 2013 by a preliminary injunction from the Supreme Court following a lawsuit proposed by the ERJ. The estimated impact of the new royalties' regulations would be massive, especially to municipalities. According to FIRJAN – a non-profit association of businesses and industries from Rio de Janeiro – between 2020 and 2023, ERJ's municipalities could face an estimated loss of revenues of 30,1 billion BRL⁵⁰ (FIRJAN, 2019). Until April 2020, the outcome remained uncertain, as the lawsuit awaited a definitive trial (Conjur, 2020).

As a result, since 2014 Rio has been attempting to diversify its economy and reduce its dependency to an unsure and possibly soon-diminishing income source. In the last five years, the city has hosted a series of international events, such as the 2014 World Cup and the 2016 Olympic and Paralympic Games, which ultimately aimed to advertise Rio's potential as an innovative, sustainable and smart economic environment where businesses could thrive (Gaffney & Robertson, 2018). While these events did in fact power the creation of some relevant urban infrastructure and management systems – such as the BRT system and COR –, it seems Rio's intended repositioning has been cut short by a regional and national economic, fiscal and political crisis.

On a national level, the country was shaken by a series of political scandals involving corruption, money laundering and overpricing of public contracts – some of which related to the sports events hosted by Rio –, which eventually led to the debatable impeachment of the then President, Dilma Rousseff, in late 2016 (for more information see Nunes and Melo (2017). At the same time, the country faced an economic crisis that, alongside the political one, reached every sphere of government. Particularly in the case of the ERJ, the crisis was aggravated by the aforementioned royalties' debacle and a series of unsound public planning decisions tainted by corrupted public servers. This chaotic scenario resulted in the ERJ filling for a Fiscal Recovery Regime (FRR)⁵¹ in 2017 due to a debt with the Federal Government of over 100 billion BRL (Agência Brasil, 2019; Mercês & Freire, 2017).

Nonetheless, the ERJ's history with corruption is not new. Over the last 20 years, all of its former State Governors and former Presidents of the Estate Legislative body (i.e. ALERJ)

⁵⁰ Around 5,4 billion euros in 08.06.20 according to the European Central Bank (s/d).

⁵¹ Devised under the Complementary Law n. ° 159/2017, which established the Fiscal Recovery Regime (FRR). Essentially, the FRR represents a series of austerity and financially restricting measures that need to be taken by the pleading States as a prerequisite for renegotiating their debt with the Federal Government (Torrezan & de Paiva, 2018) .

have been arrested (O Globo, 2019b). Conversely, the City of Rio has been more or less spared by the regional and national corruption scandals, as most of the investigated contracts concerning the Olympic Games were negotiated by the ERJ due to a constitutional competence distribution. Nevertheless, this dissonant political and economic environment – in particular the FRR austerity measures that restricted the transfer of funds from States to Municipalities - has greatly impacted the city, which resulted in a near-stagnation of most of its urban development plans (Torrezan & de Paiva, 2018).

It is within this scenario that Rio has been attempting to structure and develop its smart sustainable city agenda in the last five years. In this regard, a politically and institutionally fragmented city, with strict resource constraints and under a trust crisis that affects citizens, businesses and investors alike has not been the ideal environment for implementing new smart sustainable city solutions. Likewise, initiatives and projects that were already in place have been terminated, which will be better explained further along this section.

a. Strategy

In 2017, the City of Rio established its current urban strategy, the non-statutory Strategic Plan, or the *Plano Estratégico* 2017-2020 (Prefeitura do Rio de Janeiro, 2017). It was created in accordance with two statutory documents: the *Plano Diretor de Desenvolvimento Urbano e Sustentável*, the city's long-term master plan for sustainable urban development of 2011; and the *Plano Pluriannual* 2017-2021, the city's short term plan for budgetary expenses and management, which is revised every 4 years. Similar to Lisbon, Rio's Strategic Plan is not specifically labeled as smart or sustainable, although both concepts are mentioned multiple times throughout the document. The Plan is divided into four dimensions, seven areas of action, and 166 targets, summarized in **Table 11** below.

Table 11*Strategic Plan 2017/2020 (Rio de Janeiro)*

Dimension	Area of Action	Targets	Description
A. Economy	A1. A global, innovative, and productive Rio of opportunities	6 initiatives and 7 goals	- Promote a smart, inclusive, and economically diverse Rio, beyond its traditional petroleum dependency. - Promote tourism, creative industries, natural heritage, technology, local entrepreneurship, and social dynamism, etc. - Improve employment levels and skills. - Ensure the universal access to qualified health services prioritizing those that are in a vulnerable situation.
B. Social	B1. Preventive health and social emergency B2. Human Capital in the Carioca's ⁵² education B3. Safe and vigilant Rio	25 initiatives and 44 goals	- Reduce social and spatial disparities, promote equality and diversity as a means of preventive public safety measure, ensure a healthy environment. - Promote education and qualification and fight illiteracy - Ensure the preservation of green spaces and water bodies, address climatic risks (i.e. flooding, heat), promote bioenergy through waste treatment, improve waste management, and reduce landfills aiming towards a circular economy. - Improve sustainable transportation, buildings, and the use of soil. - Ensure an efficient, sustainable, transparent, and participative public administration. - Promote decentralized and technological governance do reduce spatial disparities.
C. Urban-Environmental	C1. Green, clean, and healthy Rio C2. Decentralized, inclusive and connected territory	22 initiatives and 35 goals	
D. Governance	D1. Governance for the citizens	12 initiatives and 18 goals	

Source: Own elaboration based on *Plano Estratégico 2017-2020* (Prefeitura do Rio de Janeiro, 2017).

The Plan's dimensions closely resemble Yigitcanlar and Kamruzzaman's (2018) previously mentioned definition of sustainability, that is, a quadruple bottom-line of economy, social, environment, and governance. However, there is a clear preponderance of Social and Urban-Environmental targets, which combined represent more than 75% of all initiatives and goals.

⁵² Carioca is the name given to those that are born or reside in Rio de Janeiro (Dicionário Michaelis, 2020).

In terms of the urban-environmental dimension, Rio has a historical, cultural, and physical connection with nature and the environment. Wedged between various mountains and the sea, more than half of the city's territory (i.e. 607 km²) is comprised of non-urbanized areas - such as forests, water bodies, and hills - and 33% (i.e. 408 km²) of it consists of nature conservation areas (Instituto Pereira Passos, 2019). The city has also hosted many international conferences pertaining to sustainable development and the environment, such as the first United Nations Conference on Environment and Development (UNCED) of 1992 and most of its subsequent meetings, which have all paved the way for important environmental resolutions and commitments among which the Agenda 21, the Kyoto Protocol and the SDG (United Nations, s/d). Overall, the environment is as much a part of the city's topography as it is its culture and way of life, although, the same cannot be said about its initiatives as argued further below.

On the other hand, the focus on the social dimension can be explained by the city's chronic struggle with socio-economic and spatial inequalities which dates back to the turn of the 19th century and early decades of the 20th century (do Lago, 2000; Valladares, 2000; Vaz, 1994). During that time, the Government, under the guise of modernization and sanitization, evicted the predominantly working-class population from the precarious, albeit well-located, collective housings of the city's center, dislodging them towards the peripheries and to the even more precarious hills and mountains throughout the city. Thus, Rio's "slumification" and suburb expansion process began. Over the next decades, the inflow of immigrants from rural areas and other parts of Brazil increased and the population spiked. As the city's economy and job opportunities grew, so did the housing prices and overall costs of living. The established inequalities, however, remained and deepened as the impoverished population kept being pushed outwards and upwards, where basic public services such as water, sanitation, health, schooling, and transport were absent or inefficient, further intensifying the disparities between Rio de Janeiro's low-income population and its middle/upper class. To this day, Rio continues to be an extremely unequal city, both in terms of infrastructure and opportunities, which more than justifies the relevance given to social aspects by its Strategic Plan (do Lago, 2000; Mosciaro & Pereira, 2019).

Structurally, the Plan consists of a mixture of measurable goals and broadly defined initiatives, each related to one or more SDG. Most initiatives are presented more as a group of actions and correlated programs, rather than an individualized project. As the initiatives are not well-defined, gathering information on their specific characteristics as well as on who is

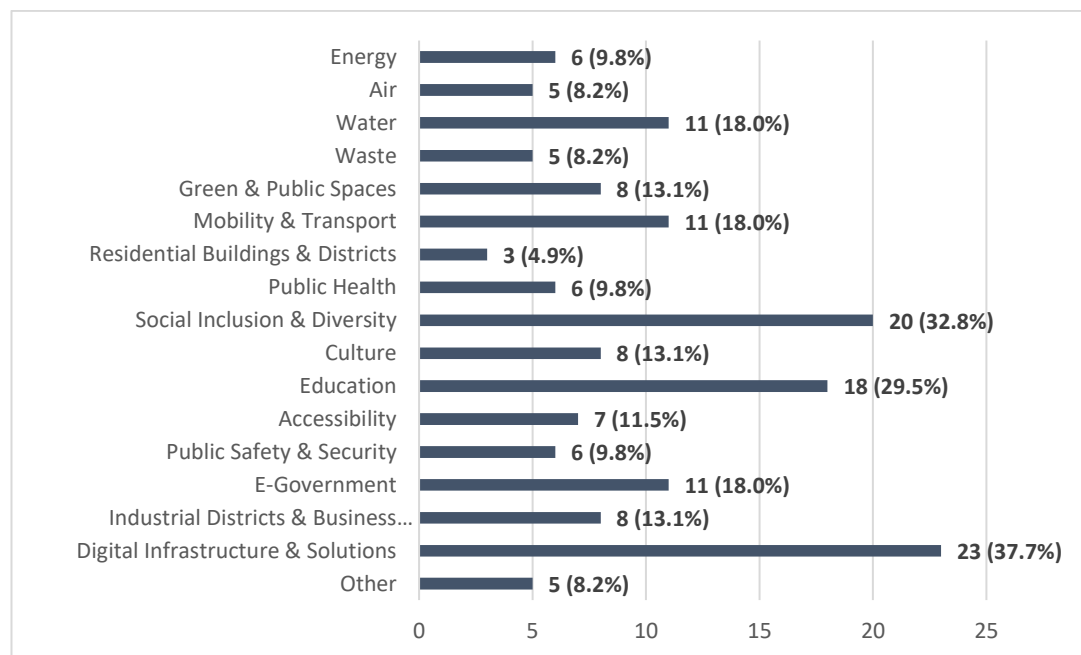
responsible for each action was challenging. Nevertheless, 22 initiatives mentioned in the Plan were individualized and cataloged, while the remaining ones either lacked enough information, were discontinued due to lack of funding, or simply never came to fruition. This was the case with initiatives such as the *Cegonha Carioca*, an initiative that aids with maternity resources, the *Restaurantes Populares*, an initiative that serves social meals for the low-income population, and the *Programa de Atenção Domiciliar ao Idoso*, an initiative for the home-care of elders (G1, 2019a, 2019b; O Globo, 2019c). All three have been interrupted or had their services crippled in the last couple of years. Likewise, renovations or expansions mentioned in the Plan never happened.

b. First classification system

After expanding on the research parameters, as per the Methodology section, 39 additional initiatives were identified and cataloged. The resulting 61 initiatives are thus distributed under the first classification system (**Table 1** in the Methodology Section):

Figure 9

Initiatives per specific domain (Rio de Janeiro)



Source: own elaboration.

The Digital Infrastructures & Solutions specific domain is once more the predominant category, involving more than 1/3 of all initiatives. Unlike the previously mentioned cities, however, the category most associated with it is E-Government (8/23), followed by Mobility &

Transport (6/23), and tied in third are Education, Public Safety & Security, and Energy (5/23). It can be argued that Rio is perhaps in a more initial stage of smartness, focusing on the digitization of internal systems and processes to improve its operations and allow for more accessible and convenient public information and services. Aside from the sensors, cameras, and monitoring systems of the city's Operations Center⁵³ and the *Sistema de Informações Urbanas* (SIURB)⁵⁴, an internal government system that manages and consolidates urban data, little evidence was found of initiatives that utilized technologies which scholars most commonly associate with smartness, that is IoT, ICT, Big Data (Bibri & Krogstie, 2017; Lee et al., 2014; Söderström et al., 2014)

In contrast to the cities previously analyzed, there is no relevant connection between Mobility & Transport and Energy or Air, save for a couple of all-round initiatives (i.e. Lab.Gov.Rio⁵⁵ and *Fórum de Desenvolvimento do Rio*⁵⁶). Apart from the biofuel plant in *EcoParque do Caju*⁵⁷, no evidence was found of an active effort to promote cleaner energy sources, electric vehicles, or greener public transports. On the contrary, there has been a recent expansion of the diesel-powered Bus Rapid Transit network, the so-called *TransBrasil* line (Prefeitura do Rio de Janeiro, 2020).

In the majority of cases (65%) the second and third most represented categories - Social Inclusion & Diversity and Education - are related to the same initiatives. This distribution resonates with the city's Plan, as the **B.** dimension and its **B1.** area of action advocate for a socially inclusive city, in which Rio's human capital is nurtured by improving its citizen's education (**Table 11**). That is the case with initiatives such as the *Naves do Conhecimento* (2020), educational hubs located in some of the city's peripheries that promote democratic and universal access to knowledge and the digital universe, and the *Projeto Ruas* (s/d), a project that connects homeless people to social services and provides health and education.

Conversely, the Environmental major domain is the one least represented in Rio's initiatives. Despite being the second most relevant dimension in terms of initiatives and goals according to the Strategic Plan, 57% of initiatives do not involve any environmental specific domain. Likewise, the average number of points per category in the Environmental specific domains is the lowest of the three (7.7), followed by Social (9.9) and Economy (15.5).

⁵³ *Centro de Operações do Rio* (COR, s/d).

⁵⁴ Prefeitura do Rio de Janeiro (s/d-d).

⁵⁵ Prefeitura do Rio de Janeiro (s/d-a).

⁵⁶ Assembleia Legislativa do Rio de Janeiro (2020).

⁵⁷ Prefeitura do Rio de Janeiro (2018a).

On a final note concerning the initiatives distribution, the most underrepresented category is Residential Buildings & Districts. Only three initiatives, less than 5% of the total, are related to this specific domain. Out of these, one is a discussion forum⁵⁸, while the remaining two, the “*Minha Casa, minha Vida*”⁵⁹ (MCMV) and the *Porto Maravilha*⁶⁰, are actively creating new homes and improving residential districts.

The MCMV is a Federal program that builds homes for low-income citizens with accessible prices and assisted loans. It is the main social-housing program in Brazil and one of the largest in the world, and since 2009 the program has been helping improve the housing situation of thousands of low-income families throughout the country. However, the program has also been affected by instances of fraud and corruption, and strongly criticized for maintaining social-spatial inequalities due to the developments being primarily located on the peripheries (da Silva Ramos & Noia, 2016; Siqueira-Gay, Gallardo, & Giannotti, 2019).

The second Residential Buildings & Districts initiative, *Porto Maravilha*, is an initiative for the revitalization of the port area and the renovation and expansion of its surrounding neighborhoods. Despite the initial intention of improving the situation for the local population, however, the initiative has been gradually pushing the port’s traditional residents away with the increase in real-estate prices from the construction of luxurious office and residential buildings (Mosciaro & Pereira, 2019). In this sense, beyond being few and far between, housing initiatives have been having mixed results in Rio de Janeiro. If taken into consideration that Rio has an estimated housing deficit of 340.000 homes⁶¹ and 22% of its population⁶² living in slums, this lack of effective initiatives concerning Residential Buildings & Districts is concerning.

c. Second classification system

The initiatives were carried out by 136 organizations, eight of which are multicategory ones (refer to **Annex B**). The Industry is once more the category with the highest number of organizations, although the organizations’ overall distribution is more evenly balanced when compared to the other cities.

⁵⁸ Idem 42.

⁵⁹ Prefeitura do Rio de Janeiro (2015).

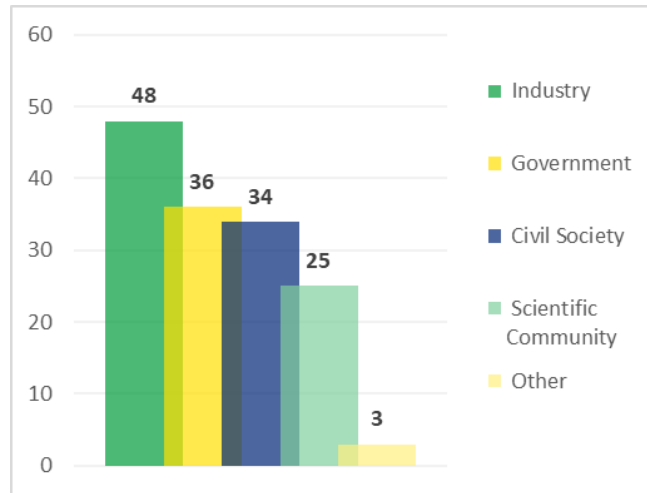
⁶⁰ Companhia de Desenvolvimento Urbano da Região do Porto do Rio de Janeiro (2020).

⁶¹ According to a study from 2018 by the Fundação João Pinheiro concerning the housing deficit of Brazil in general and of Rio’s metropolitan region in specific (Fundação João Pinheiro, 2018).

⁶² Instituto Pereira Passos (2019).

Figure 10

Organizations per category (Rio de Janeiro)



Source: own elaboration.

In terms of the second classification system (**Table 2** in the Methodology Section), Rio's initiatives are divided as such:

Table 12

Initiatives per organization category (Rio de Janeiro)

No. Agents	No. Initiatives	A Industry	B Government	C Civil Society	D Scientific Community	E Other
1	41	4 (10%)	34 (83%)	3 (7%)	0	0
2	12	4 (33%)	11 (92%)	6 (50%)	2 (17%)	1 (8%)
3	5	5 (100%)	5 (100%)	4 (80%)	1 (20%)	0
4	3	2 (67%)	3 (100%)	3 (100%)	3 (100%)	1 (33%)
Total:	61	15 (25%)	53 (87%)	16⁶³ (26%)	6 (10%)	2 (3%)

Source: own elaboration

Around 1/3 of the initiatives involve multiple agents, namely 20, which results in the overlap observed in **Table 12**. Out of those, 12 involve two agents, five involve three agents, and two involve all major four. Similar to Copenhagen, Lisbon, and London, the Government is involved in the majority of the initiatives (87%), as well as most of the individual ones (83%).

⁶³ Additionally, there are 5 initiatives in which the Civil Society is a mere participant (marked with a "P" in the Annex A).

In contrast to all cities analyzed so far, Rio is the only city in which single-agent initiatives surpass multiple agent ones, going as far as doubling the amount. A possible interpretation is that there is either a lack of interest/funds from the Industry, Civil Society, and Scientific Community, an inefficient effort from the Government in coordinating with said agents, or more likely, a mixture of both. The disconnection is even more flagrant where the Scientific Community is concerned, as only 10% of all initiatives include an agent from this category.

In regard to the Civil Society, 26% of the initiatives involve this category either individually, as citizens, or collectively, as associations, NGOs, and Foundations. However, only 5 initiatives provided substantial evidence of effective citizen participation (highlighted in **Annex A**). To illustrate, two of those are the *Participa Rio*⁶⁴, a citizen participation platform that is currently discussing the city's new Sustainable Development Plan, and the *Mutirão Reflorestamento*⁶⁵, a reforestation program with over 33 years of existence that has planted over 10 million native trees through the combined effort of the Communities and Government.

In sum, much like London, Rio's urban development strategy is centralized, although not necessarily holistic. As previously mentioned, while the strategy itself mentions multiple dimensions, it focuses on two (Urban-Environmental and Social). Additionally, the initiatives distribution partially contradicts the strategy, as the Environmental major domain is particularly underrepresented and there is a predominance of technology-related and distinctly governance-inclined initiatives. Furthermore, there is an evident top-down approach for the city's projects, which are most often undertaken individually by the Government, without the collaboration of the remaining sectors of society.

⁶⁴ Prefeitura do Rio de Janeiro (s/d-b).

⁶⁵ Prefeitura do Rio de Janeiro (s/d-c).

Section V - Results and Discussion

As observed throughout the case studies, the approach for tackling the issue of smart and sustainable urban development is mostly unique to each city, as they have their distinctive characteristics, dimensions, culture, strong-suits, and shortcomings. In that sense, when concerning the aforementioned adaptation of L. Mora et al. 's (2019) dichotomies, each city is situated in distinct positions on the spectrum. Nonetheless, while in some respects they may occasionally intersect, no two cities are entirely the same.

I. Dichotomies analyses

a. First dichotomy

In terms of the first dichotomy, with the exception of London and Copenhagen, there seems to be an effort for pursuing an integrated and holistic approach, at least where strategies are concerned. While Berlin, Lisbon – and to some degree Rio de Janeiro - have holistic and centralized strategies, Copenhagen's strategy is scattered throughout various documents. This gives the city strategy an overall segmented perspective, despite being somewhat holistic when the individual strategies are all pieced together as parts of a whole. In London's case, there is an apparent combination of both patterns. The city does have a centralized smart city strategy, which is segmented and technology-oriented, but in parallel additional strategies pertaining to other urban aspects help guide London's urban development and give it a more cohesive approach. Nonetheless, as previously mentioned in London's section, its smart city strategy substantially influences the others, which leads to London's overall approach being perceived as segmented and technocentric.

Conversely, the initiatives' distribution in all of the cities is anything but holistic: Berlin and London are extremely technology-centered, Copenhagen's main focus is indubitably the environment, Rio de Janeiro is in a tenuous equilibrium between social and economic, and Lisbon is comparatively the most balanced one in terms of the previously mentioned three aspects of sustainability (social, economy, environment). Nonetheless, all four benchmark cities - and particularly Copenhagen - are lacking in a relevant aspect, the social one.

The table below represents the average number of points per specific domain categories under the three major domains for each analyzed city. The sum of points of each major domain was divided by the number of specific domain categories to reach the domain average. The same process was followed with the total number of points by dividing it by the total number of

categories to reach the total average. This allowed for an intra-city comparison of major domains relative to each other as well as to the total number of points. Those that are above the total average have been highlighted in red, and those that are below in blue. The results were then divided by the total number of initiatives in order to reach a relative value that is better comparable inter-city.

Table 13

Cities comparison (Major Domains)

Cities / # Initiatives	Major Domain / Total	Points	Specific Domain	Average	Relative
Berlin (149 Initiatives)	Environment	274	6	45.7	0.31
	Social	140	8	17.5	0.12
	Economy	89	2	44.5	0.30
	Total	513	17	30.2	0.20
Copenhagen (101 Initiatives)	Environment	193	6	32.2	0.32
	Social	58	8	7.3	0.07
	Economy	41	2	20.5	0.20
	Total	298	17	17.5	0.17
Lisbon (114 Initiatives)	Environment	152	6	25.3	0.22
	Social	110	8	13.8	0.12
	Economy	60	2	30.0	0.26
	Total	340	17	20.0	0.18
London (152 Initiatives)	Environment	166	6	27.7	0.18
	Social	136	8	17.0	0.11
	Economy	101	2	50.5	0.33
	Total	417	17	24.5	0.16
Rio de Janeiro (61 Initiatives)	Environment	46	6	7.7	0.13
	Social	79	8	9.9	0.16
	Economy	31	2	15.5	0.25
	Total	161	17	9.5	0.16

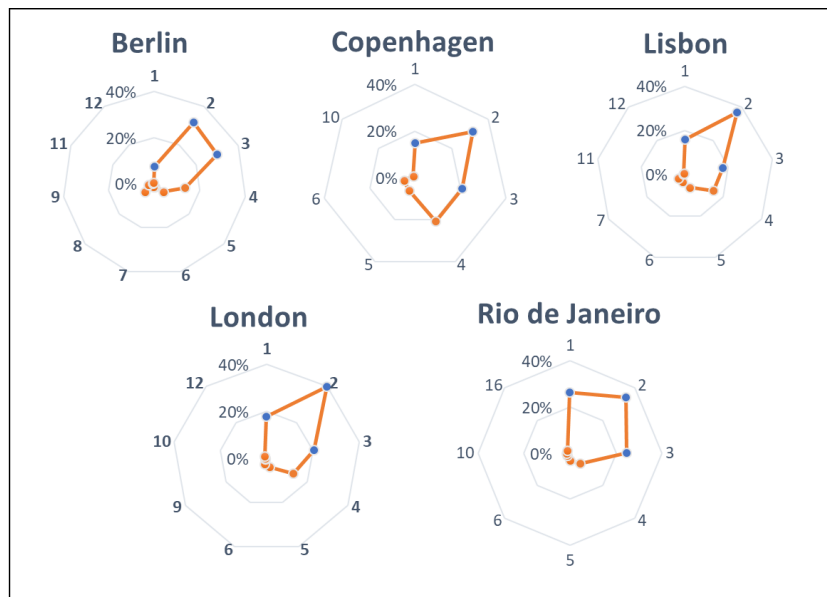
Source: own elaboration / *Note.* The total is comprised of the specific domain Other plus those of under each major domain: environment (Energy, Air; Water; Waste; Green & Public Spaces; Mobility & Transport), social (Residential Buildings & Districts, Public Health, Social Inclusion & Diversity; Culture; Education; Accessibility; Public Safety & Security; and E-Government), and economy (Digital Infrastructure & Solutions and Industrial Districts & Business Accelerators).

Berlin is noticeably the city with the greatest ratio between the average total number of points and the total number of initiatives (i.e. 0,2). That is to say, its initiatives are individually related to a higher number of specific domains, acquiring more points per initiative than the other cities. In this sense, Berlin's initiatives are arguably more multifaceted/holistic when individually considered. On the other end, London and Rio de Janeiro are the cities where each

individual initiative is the least comprehensive and the most targeted towards a single - or at best two - specific domain. In this sense, **Figure 11** below provides a graphic representation of the percentages of initiatives that are related to multiple specific domains for each city.

Figure 11

Percentage of multi-specific domains initiatives by city



Source: own elaboration

The values on the outer-edge of the figures - for instance, one to 16 in Rio's case - represent the number of specific domains related to an individual initiative. The closer the dots are to the edge and each number, the higher the percentage of initiatives that are related to that number of domains (e.g. 40% of London's initiatives are related to two specific domains).

The most common specific domains combinations for each city were already detailed in the case study section, however, it is important to stress that there seems to be a trend within the European benchmark cities of focusing on initiatives that combine Air, Energy, Digital Infrastructure & Solutions, and Mobility & Transport aspects. On the other hand, Rio de Janeiro has the highest percentage of single category initiatives, and the most common combinations of specific domains are Digital Infrastructure & Solutions, Education, and Social Inclusion & Diversity. Nonetheless, in all five cities, the majority of initiatives are within the one through three brackets of specific domains affected by each initiative, as highlighted by the blue dots in **Figure 11** above. This means that very few initiatives are internally holistic, their primary aim

is to solve two or three correlated urban challenges (i.e. reducing GHG emissions by fostering an electric vehicle market).

When comparing the values for each major domain, it is apparent that the social domain is the one where the benchmark cities are the most lacking. In all four cities, the average number of points of the Social domain is below the total average, as well as substantially inferior to the average of the other domains (refer to **Table 13** above). In this sense, Copenhagen is where the issue is the most critical, as the Social domain is less than half of the total average and four times lower than the highest average for the city, the Environment domain. Conversely, according to the World Bank (2020b), Denmark is the country with the lowest rates of inequality out of the five studied, which could justify the reduced attention given to these aspects by Copenhagen as there are simply fewer critical social issues to address, or at least they do not rank high in stakeholders' agendas.

Overall, the Economy major domain is the predominant one, apart from Berlin where it is mostly even with the Environment one and Copenhagen, where the Environment is indeed a preponderant domain. However, as previously mentioned throughout the individual case studies, all benchmark cities have a substantial amount of initiatives related to technology and as such a red flag should be raised about potential technocentricity, socio-spatial inequalities, and digital disparities, particularly as there seems to be a correspondent lack of Social initiatives (Angelidou, 2015; Martin et al., 2018; Shelton et al., 2015). Likewise, Copenhagen's ultra-environmental approach could result in issues with environmental gentrification and the aforementioned greening paradigm, leading to an oversimplification of the understanding of urban sustainability to strictly green infrastructure solutions and climate targets (Checker, 2011; Martínez et al., 2016; Schuetze & Chelleri, 2016).

b. Second dichotomy

Both Copenhagen and Berlin have a strong participation of the Scientific Community and less so of the Civil Society, as opposed to Lisbon and London. In Lisbon and London, the presence of the Civil Society - through individuals, community associations, non-profits, and charities - is so substantial that this category has even substituted the Scientific Community as the third helix in traditional triple-helix models of collaboration. While the reduced participation of academia might be an issue in terms of innovation potential, as previously mentioned in Lisbon's case study, ideally the balance should be met between academic innovation, citizen participation, government drive, and industry investment (Etzkowitz & Leydesdorff, 2000;

Galvão et al., 2017; Mora et al., 2019). In this sense, Berlin, Copenhagen, and London seem to be the cities where this balance was best achieved, as more than 30% of their initiatives were undertaken within triple or quadruple-helix models of collaboration (refer to **Tables 5, 6, and 10**).

Conversely, Lisbon and Rio de Janeiro are the cities with the highest number of individual and double-helix initiatives, with Rio de Janeiro being the only city in which the majority of initiatives is individual (and taken by the Government). Berlin, on the other hand, is the city where the Government is the least present, in both individual and collective initiatives and, despite also having a high percentage of individual initiatives (i.e. the same as Lisbon's), the city compensates with increased triple and quadruple-helix ones.

Nonetheless, all five cities are situated in the individual/dual-helix model of collaboration section of the spectrum. Notwithstanding the efforts for achieving a more collaborative environment, the fact remains that in all analyzed cities the majority of initiatives are still undertaken by either a single organization, most commonly the Government, or by two organizations, often Government-Industry (i.e. Copenhagen and Berlin) and Government-Civil Society (Lisbon, London, and Rio de Janeiro).

c. Third dichotomy

Particularly in the cases of Lisbon and London, and to a lesser extent Copenhagen and Berlin, there seems to be an effort from the benchmark cities to further include citizens and communities in shaping their city's future, in a mix of top-down and bottom-up approaches. London and Lisbon are the cities where the civil society has actively participated in the highest number of initiatives, followed by Copenhagen, Berlin, and Rio de Janeiro. Nonetheless, the cities of Copenhagen and Berlin are still distinctly government-industry led and, while in the case of the former the Government is indeed the main agent, in the latter the Industry is more evenly balanced with the Government. That is not to say that Copenhagen does not have a strong participation from the Industry sector, which, in fact, the city does in more than half of its initiatives, however, the Government remains the main conductor behind Copenhagen's initiatives. Likewise, London and Lisbon also have a strong involvement of both Government and Industry, but the increased presence of the civil society is the counterbalance that positions these cities more towards the middle of the scale between top-down and bottom-up.

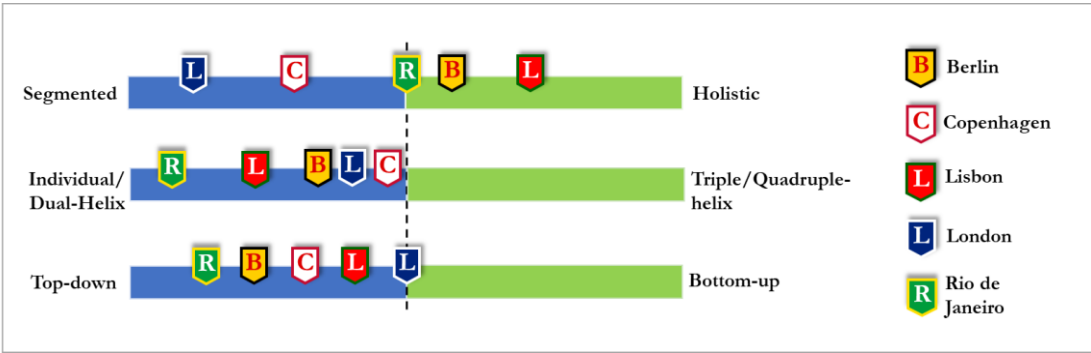
A strong connection with the Industry is a defining characteristic of the smart city strategies of Berlin and London. Both cities are considered extremely attractive to new

businesses and especially start-ups and are consistently the top two European capitals in terms of start-up ecosystem nurturing programs and venture capital investments (Business Insider, 2016; KPMG & Greater Paris Investment Agency, 2019; UKTN, 2018). Likewise, they are the ones with the highest percentages of economy-related initiatives, notably those of technological nature, and the ones most likely to fall into technocratic behaviors if left unchecked. In the case of Rio de Janeiro, the distribution is similar to Copenhagen's in a sense that the Government is prevalent, but more akin to Berlin in terms of a lesser representation from the Civil Society. This results in it being the city with the approach more sharply perceived as top-down.

In sum, most cities, even the benchmark ones, are on the top-down, individual/dual-helix model of collaboration end of the spectrum, while in terms of the first dichotomy - segmented or holistic - the distribution is more even. To better illustrate, the five cities can thus be represented within the dichotomies' spectrum:

Figure 12

Dichotomies Spectrum



Source: own elaboration.

II. Research questions discussion

In this sense, this study's first RQ, that is, how are the European benchmark cities positioned in terms of a broad definition of sustainability, can now be answered. While the initial assumption was that even the benchmark cities would most likely be lacking in the Social and, especially, in the Environmental aspects of the triple-bottom lines of sustainability, this was not entirely the case. On the contrary, all benchmark cities have a structured strategy to deal with the current climate emergency and are indeed taking steps to reduce GHG emissions, transition their energy sources to renewable, limit climate change impacts, and overall create a more environmental-friendly urban space and society. The previously mentioned international

commitments and European regulations have been important drivers for this change towards climate awareness, however, the objectives, culture, and local commitments of each city are what determine the degree and speed of the process. Such is the case of Copenhagen's ambitious pledge to be a net-zero capital in 2025, 25 years before the any of the other benchmark cities' intended deadlines (Københavns Kommune, 2012b).

Conversely, the Social aspect was recurrently the most deficient one. As such, despite being recognized as smart and sustainable by various ranking systems, these cities are still prone to suffer from the issues most commonly criticized by academia when discussing the topic of smart cities. Their lack of balance between the Economy axis and remaining bottom lines of sustainability, in particular the Social one, is what makes these cities superficially smart, but also what keeps them essentially unsustainable, as the urban development is achieved and the economic opportunities are expanded, but socio-economic inequalities remain and are potentially aggravated (Martin et al., 2018; Shelton et al., 2015).

When concerning the triple bottom-lines of sustainability, unlike the benchmark cities, Rio is primarily lacking in the Environment category, which can once more be partly explained by the city's inadequate urban planning. Since 2018, the municipal government has been working on the creation of a Climate Action Plan (CAP) which would guide the city's urban development for the next decades and pave the way for a GHG emissions neutral city by 2050. However, the CAP, much like the new intended version of the city's masterplan from 2011 (i.e. the Sustainable Development Plan-SDP), has yet to leave the discussion phase (Prefeitura do Rio de Janeiro, 2018b, s/d-b). In parallel, the city's administration has been neglectful when dealing with climate change and its impacts on the city's daily life, particularly when concerning Rio's most pressing and habitual environmental threats: landslides, heavy storms, and flooding events (CCST/INPE & NEPO/UNICAMP, 2011). In five years, Rio's Municipal Government has reduced the budget for flood control by 77%, from 288 million BRL in 2013 to 66 million BRL in 2018. Likewise, the budgets for pavement maintenance and drainage programs have also been cut by 86% (O Globo, 2019a). For a city with almost a quarter of its population living precariously atop hills or in makeshift households, locations inherently at a greater risk of suffering from landslides after heavy rain, these type of disinvestments when the climate situation is expected to worsen and not lessen in the next decades is a sign of institutional indifference both towards the climate emergency as well as to the city's most vulnerable population.

A similar parallel can be made concerning Energy and Mobility solutions. Although the city has an incredible solar potential – which has already been mapped by the city’s administration and is available in an open-access platform – this power has remained mostly untapped. A government-driven energy transition could incentivize the use of this potential, as was the case with the European benchmark cities. In this sense the electrification of public transport vehicles has been promised multiple times by different administrations, only to be postponed or abandoned after the election period had ended or the international investments diminished⁶⁶ (Prefeitura do Rio de Janeiro, 2011, 2019; Veja Rio, 2014). Overall, this opportunity is unlikely to be seized at the moment. The country’s present political and economic crisis, as well as the many existing barriers to electric vehicles (public or privately owned) in Brazil - e.g. costs, non-standardized infrastructures and regulations, the existence of an already established clean alternative in the sugarcane ethanol, etc. – make achieving the political coordination, regulatory framework, and financial/tax incentives necessary for the implementation of an electric-vehicles-based model of society currently improbable (Brito et al., 2019; Delgado, Costa, Febraro, & Silva, 2017).

While Rio seems to be trying to catch up on technological aspects, there is also room for improvement when concerning the assimilation of IoT, ICT, and Big Data solutions into planning and decision-making processes. For instance, the city’s Center of Operations already uses some of this technology (i.e. cameras and sensors) in its daily functions. However, the COR primarily focuses on immediate and targeted issues, such as public security, crime control, traffic management, and emergencies response, wasting the opportunity to utilize this technology to the fullest as an integrated hub for the management and planning of the city as a whole (Gaffney & Robertson, 2018).

In parallel, the city has issues with ensuring public governance and transparency. As stated by Patterson et al. (2017), “governance is inherently implicated in any intentional effort to shape ‘transformations towards sustainability’ (...) and transformations towards sustainability are deeply and unavoidably political” (p. 2). In this sense, Rio’s current political chaos is a strong deterrent for change. Unlike Berlin and Lisbon, Rio does not have a dedicated website for the city’s urban development strategy and many of its internal processes are not yet fully digitalized, although the city has been trying to rectify this through various E-Government initiatives.

⁶⁶ For instance, with the end of the major sports events in 2014 and 2016.

Nonetheless, this presents an issue with accountability, as monitoring is hindered by a lack of transparent and available information.

As this work's analysis of the organizations involved in Rio's initiatives has demonstrated, most of all the city struggles with creating an efficient collaborative environment. The city's current strategy of government-led initiatives with little to no participation of the remaining agents of society, while understandable considering the current state of disarray of the city's economy and politics, is detrimental for achieving optimum levels of sustainable urban development. Berlin's example of bringing urban issues and challenges to the universities and calling upon businesses to fund and scale-up the solutions seems to be a good model to follow, provided that increased participation by the Civil Society is also insured.

Conversely, Rio is the only city where the Social domain is not the least represented one. As previously mentioned, this is a consequence of the city trying to overcome centuries of socio-spatial inequalities by promoting various social programs, mostly through Education and Social Inclusion & Diversity initiatives. Nonetheless, as argued by Medeiros, Barbosa, and Carvalhaes (2020, p. 12), "education is not a panacea to poverty and inequality and even if it was, the results would not be immediate.". There are limits to what education alone can achieve in terms of bridging the income gap and reducing inequality, particularly in societies where the issue is so ingrained like Rio. In that sense, while Rio indeed has some seemingly successful social initiatives - such as the previously mentioned *Minha Casa, Minha Vida*, *Naves do Conhecimento*, and *Projeto Ruas* – the city still has a long way to go.

On a final note, Rio is severely lacking in terms of active citizen participation. Unlike the benchmark cities, Rio's recently established citizen participation portal (i.e. *Participa.Rio*) is not open to all of the city's initiatives and projects, which is in itself an issue with accountability. Currently, *Participa.Rio* only allows for discussions concerning two initiatives: the city's future Master Plan (i.e. the SDP) and its consolidated reforestation program. Initiatives from the European cities like *Mein Berlin*, *Bliv Hørt*, *Lisboa Participa*, and Talk London are comprehensive platforms where, as stated by Angelidou (2017) citizens are "regarded more as agents of change, rather than mere collaborators" (p. 14). Conversely, Rio seems to consider its citizens only as recipients of services and targets of actions, which creates a disconnection between that which the population needs and deems important, and what the Government actually plans for and provides (Cowley, Joss, & Dayot, 2018).

To summarize and answer the second RQ, Rio's approach to the smart sustainable city phenomena can be described as short-term-based, inarticulate, and fragmented. For the past

five years, the city has failed to progress much beyond its World Cup/Olympic legacy, due to both internal and external forces: the former in the way of poor planning decisions and lack of funds; and the latter in the form of nation-wide political and economic crises. That is not to say, however, that Rio has remained entirely unchanged, there is a perceivable effort from the city to digitalize its processes, as well as to establish a more holistic, long-term strategy for its future.

Nonetheless, Rio still has much to learn from the so-called European “best practices”, even from their flaws. Despite not being thoroughly achieved in any of the analyzed cities, collaboration and citizen-driven participatory approaches are recognized as essential elements to creating a harmonious and innovative urban environment (Etzkowitz & Leydesdorff, 2000; Galvão et al., 2017; Mora et al., 2019). Likewise, ensuring a veritably holistic approach with a mix of top-down and bottom-up initiatives seems to be the path to avoid or at least restrict many of the biases that customarily follow the smart city paradigm. In terms of individualized projects, however, most European initiatives would be unsuitable for direct transposition to Rio de Janeiro’s reality. Some degree of adaptation is required, as the city’s and the country’s current economic and political crises, added to Rio’s historic deficiencies in many of the main aspects that compose a sustainable urban environment, make it substantially harder to implement initiatives that demand major investments, large-scale infrastructures or complex political alignments.

Section VI - Conclusion

This work aimed to discuss the smart sustainable city phenomenon from the perspective of a Global South representative city, Rio de Janeiro, as opposed to that of the benchmark European cities of Berlin, Copenhagen, Lisbon, and London. The systematic review of each city's strategy and initiatives reinforced previous assumptions that smartness is not always synonym to what's modernly perceived as sustainable and that the social aspect is often the one most commonly disregarded by public administrators both in terms of initiatives distribution, as well as in the pursuance of citizen representativeness within a city's urban development process. At the same time, the examined cases revealed a perceivable increase in the institutional concern with climate change and the climate emergency, albeit with varying degrees in each of the analyzed cities.

The research has also shown that despite reiterated warnings from academics about the threats and limitations of this discourse, in both the benchmark cities and Rio de Janeiro the smart city concept is still perceived as an intrinsically technological process that simultaneously feeds from and fuels a city's economy. In this regard, this work's findings suggest that less holistic strategies, ineffective collaborative environments, and reduced participation from the citizens in shaping a city's future are strong contributors to the persistence of this technocratic perspective, particularly when the urban agenda is strongly aligned with Industry interests.

As scientific literature has demonstrated, the smart sustainable city paradigm, much like the cities themselves, is an ever-evolving concept that is constantly being revised and added upon. As such, these types of systematic case studies analyses are an opportunity to compile, organize, and divulge multiple cities' experiences and practices – be they positive or negative – and to create a network of knowledge that administrators, academics, citizens and businesses can utilize to help shape the smart sustainable cities of the future.

While the aim of this work was not to create a generalized inference, additional research would be invaluable to expand these conclusions beyond the contexts of benchmark European cities and a Global South-representative megacity. As this work's methodical review has shown – despite standardized bloc regulations and development-stage similarities – culture and context greatly influence urban agendas. As such, conducting further studies with a larger pool of cases in a wider range of stages of development could prove instrumental in improving this work's proposed methodology, as well as allowing for a deeper understanding of the smart sustainable city phenomena and its multiple interpretations around the world.

Furthermore, as this work's research indicates, collaboration is an essential matter for the development of smart sustainable cities. Many studies have been proposed concerning intra-city collaboration models, such as the triple/quadruple helix dichotomy referred to throughout this dissertation, however, little has been explored about inter-city collaboration methods and how does it affect urban planning decisions. In this regard, there seems to be a trend among cities, particularly European ones, to establish international networks of cities for the sharing of knowledge and experiences. Perhaps expanding and fostering these networks might provide more efficient and replicable solutions to the complex and transversal challenges (e.g. social disparities, climate emergency, etc.) currently faced by humanity.

Future research should also be conducted into better understanding the impacts of crises - economic, political, and, most recently, sanitary ones – in the development of consolidated and emerging smart sustainable cities. This dissertation's findings suggest that stagnation, and sometimes even regression, is a plausible consequence of persistent critical conditions, particularly when combined with preexisting structural fragilities. In this sense, nearly a decade of cyclical political and economic crises in Rio de Janeiro have stacked upon a secularly unequal and fragmented society, the effects of which we are just now beginning to feel and understand.

As governmental and industry budgets get strained, administrators – both public and private – are forced to prioritize. In this regard, it is reasonable to assume that critical and/or less investment-intensive initiatives are given precedence over high-investment long-term ones, such as transport and sanitation. While basic infrastructure has long since been the Government's responsibility in most urban agendas, the industry does indeed play a valuable role in helping finance or operate these services. The question stands if and how critical conditions affect such essential urban services, particularly as private investors might opt to take the less risky path of reducing development investments and focusing on simply maintaining current services afloat. This could result in further fragmentation between public and private players and a stronger hand from the Government in the guidance of urban development, as Rio's case suggests.

Nonetheless, the most recent pandemic has shown unprecedented examples of collaboration from the various actors of society worldwide. This indicates that disorganization and stagnation are not the only outcomes of critical environments. To this end, thoroughly quantifying and analyzing the potential impacts of current and previous crises might provide precious insights on how to better address future ones and ensure that smart and sustainable

are not merely labels, but indeed cornerstones of a balanced urban environment capable of surpassing the hardest internal and external challenges.

References

- Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., & Airaksinen, M. (2017). What are the differences between sustainable and smart cities? *Cities*, 60, 234-245. doi:<https://doi.org/10.1016/j.cities.2016.09.009>
- Angelidou, M. (2015). Smart cities: A conjuncture of four forces. *Cities*, 47, 95-106. doi:<https://doi.org/10.1016/j.cities.2015.05.004>
- Angelidou, M. (2017). The Role of Smart City Characteristics in the Plans of Fifteen Cities. *Journal of Urban Technology*, 24(4), 3-28. doi:10.1080/10630732.2017.1348880
- Anthopoulos, L. (2017). Smart utopia VS smart reality: Learning by experience from 10 smart city cases. *Cities*, 63, 128-148. doi: <https://doi.org/10.1016/j.cities.2016.10.005>
- Anthopoulos, L., & Reddick, C. (2016). Understanding electronic government research and smart city: A framework and empirical evidence. *Information Policy*, 21(1), 99-117. doi:10.3233/IP-150371
- Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., . . . Portugali, Y. (2012). Smart cities of the future. *The European Physical Journal Special Topics*, 214(1), 481-518. doi:10.1140/epjst/e2012-01703-3
- Bibri, S. E., & Krogstie, J. (2017). Smart sustainable cities of the future: An extensive interdisciplinary literature review. *Sustainable Cities and Society*, 31, 183-212. doi: <https://doi.org/10.1016/j.scs.2017.02.016>
- Bretas, A. M., Laureano, F. G., Quintanilha, N., & Nazareth, P. (2020). Dependência das Rendas Petrolíferas nos Municípios do RJ. 2020(36). doi:10.12957/geouerj.2020.48410
- Brito, T. L. F., Islam, T., Stettler, M., Mouette, D., Meade, N., & Moutinho dos Santos, E. (2019). Transitions between technological generations of alternative fuel vehicles in Brazil. *Energy Policy*, 134. doi:10.1016/j.enpol.2019.110915
- Bundesministeriums für Umwelt Naturschutz und nukleare Sicherheit - BMU. (2016). Climate Action Plan 2050. Retrieved March 18, 2020 from <https://www.bmu.de/en/publication/climate-action-plan-2050/>
- Camagni, R., Capello, R., & Nijkamp, P. (1998). Towards sustainable city policy: an economy-environment technology nexus. *Ecological Economics*, 24(1), 103-118. doi: [https://doi.org/10.1016/S0921-8009\(97\)00032-3](https://doi.org/10.1016/S0921-8009(97)00032-3)
- Câmara Municipal de Lisboa. (2019b). Grandes Opções do Plano 2020-2023. Retrieved April 22, 2020 from https://economiaeinovacao.lisboa.pt/fileadmin/download_center/orcamento/2020/gop/GOP_2020_2023.pdf
- Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). Smart Cities in Europe. *Journal of Urban Technology*, 18(2), 65-82. doi:10.1080/10630732.2011.601117

- Cardullo, P., & Kitchin, R. (2019). Smart urbanism and smart citizenship: The neoliberal logic of ‘citizen-focused’ smart cities in Europe. *Environment and Planning C: Politics and Space*, 37(5), 813-830. doi:10.1177/0263774X18806508
- Carvalho, L. (2015). Smart cities from scratch? A socio-technical perspective. *Cambridge Journal of Regions, Economy and Society*, 8(1), 43-60. doi:10.1093/cjres/rsu010
- CCST/INPE & NEPO/UNICAMP (2011). Megacidades, Vulnerabilidades e Mudanças Climáticas: Região Metropolitana do Rio de Janeiro. Retrieved June 26, 2020 from <http://www.data.rio/datasets/dc00f0608dc5449abc03271c4a66a804>
- Checker, M. (2011). Wiped Out by the “Greenwave”: Environmental Gentrification and the Paradoxical Politics of Urban Sustainability. *City & Society*, 23(2), 210-229. doi:10.1111/j.1548-744X.2011.01063.x
- Cowley, R., Joss, S., & Dayot, Y. (2018). The smart city and its publics: insights from across six UK cities. *Urban Research and Practice*, 11(1), 53-77. doi:10.1080/17535069.2017.1293150
- da Silva Ramos, J., & Noia, A. C. (2016). A construção de políticas públicas em habitação e o enfrentamento do déficit habitacional no Brasil: uma análise do Programa Minha Casa Minha Vida. *Desenvolvimento em Questão*, 14(33), 65-105.
- de Freitas Netto, S. V., Sobral, M. F. F., Ribeiro, A. R. B., & Soares, G. R. L. (2020). Concepts and forms of greenwashing: a systematic review. *Environmental Sciences Europe*, 32(1). doi:10.1186/s12302-020-0300-3
- de Jong, M., Joss, S., Schraven, D., Zhan, C., & Weijnen, M. (2015). Sustainable–smart–resilient–low carbon–eco–knowledge cities; making sense of a multitude of concepts promoting sustainable urbanization. *Journal of Cleaner Production*, 109, 25-38. doi: <https://doi.org/10.1016/j.jclepro.2015.02.004>
- Delgado, F., Costa, J. E. G., Febraro, J., & Silva, T. d. F. B. d. (2017). Carros elétricos.
- Dietz, S., & Neumayer, E. (2007). Weak and strong sustainability in the SEEA: Concepts and measurement. *Ecological Economics*, 61(4), 617-626.
- do Lago, L. C. (2000). *Desigualdades e segregação na metrópole: o Rio de Janeiro em tempo de crise*. Observatório IPPUR/UFRJ-FASE.
- Dutton, W. H., Blumler, J. G., & Kraemer, K. L. (1987). *Wired cities: Shaping the future of communications*. GK Hall & Co.
- Erreygers, G. (2009). Hotelling, Rawls, Solow: How Exhaustible Resources Came to Be Integrated into the Neoclassical Growth Model. *History of Political Economy*, 41(Suppl_1), 263-281. doi:10.1215/00182702-2009-027
- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: from National Systems and “Mode 2” to a Triple Helix of university–industry–government relations. *Research Policy*, 29(2), 109-123. doi: [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)

European Commission (2016). Urban agenda for the EU - Pact of Amsterdam Retrieved November 23, 2019 from https://ec.europa.eu/futurium/en/system/files/ged/pact-of-amsterdam_en.pdf

European Parliament (2014). Mapping smart city in the EU. European Parliament Retrieved from [https://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET\(2014\)507480_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf).

FIRJAN (2018). Retratos Regionais - Rio de Janeiro. Retrieved May 28, 20 from <https://www.firjan.com.br/publicacoes/publicacoes-de-economia/retratos-regionais-1.htm>

FIRJAN (2019). Avaliação dos impactos para o estado do Rio e seus municípios com a redistribuição dos royalties e participações especiais. Retrieved June 8, 20 from <https://www.firjan.com.br/lumis/portal/file/fileDownload.jsp?fileId=2C908A8A6D5F320E016D8265279A5739>

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative inquiry*, 12(2), 219-245.

Fundação João Pinheiro (2018). *Déficit habitacional no Brasil 2015*. Belo Horizonte: Fundação João Pinheiro. Centro de Estatística e Informações.

Gaffney, C., & Robertson, C. (2018). Smarter than Smart: Rio de Janeiro's Flawed Emergence as a Smart City. *Journal of Urban Technology*, 25(3), 47-64. doi:10.1080/10630732.2015.1102423

Galvão, A., Mascarenhas, C., Gouveia Rodrigues, R., Marques, C. S., & Leal, C. T. (2017). A quadruple helix model of entrepreneurship, innovation and stages of economic development. *Review of International Business and Strategy*, 27(2), 261-282. doi:10.1108/RIBS-01-2017-0003

Giffinger, R., Haindlmaier, G., & Kramar, H. (2010). The role of rankings in growing city competition. *Urban Research and Practice*, 3(3), 299-312. doi:10.1080/17535069.2010.524420

Gills, B., & Morgan, J. (2019). Global Climate Emergency: after COP24, climate science, urgency, and the threat to humanity. *Globalizations*. doi:10.1080/14747731.2019.1669915

Greater London Authority (2018a). London Environment Strategy. Retrieved May 12, 2020 from https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf

Greater London Authority (2018b). Mayor's Transport Strategy. Retrieved May 12, 2020 from <https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf>

Greater London Authority (2018c). Smarter London Together. Retrieved April 26, 2020 from https://www.london.gov.uk/sites/default/files/smarter_london_together_v1.66_-_published.pdf

Hartwick, J. M. (1977). Intergenerational equity and the investing of rents from exhaustible resources. *The american economic review*, 67(5), 972-974.

Hiremath, R., Balachandra, P., Kumar, B., Bansode, S., & Murali, J. (2013). Indicator-based urban sustainability—A review. *Energy for Sustainable Development*, 17(6), 555-563. doi: <https://doi.org/10.1016/j.esd.2013.08.004>

Hollands, R. G. (2008). Will the real smart city please stand up? Intelligent, progressive or entrepreneurial? *City*, 12(3), 303-320.

IBGE (2019). Estimativas de População. Retrieved May 28, 2020 from <https://www.ibge.gov.br/estatisticas/sociais/populacao/9103-estimativas-de-populacao.html?=&t=o-que-e>

IPCC (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1132 pp. In.

IPCC (2019). Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate. Retrieved November 25, 2019 from <https://www.ipcc.ch/srocc/>

Ishida, T., & Isbister, K. (2000). *Digital cities: technologies, experiences, and future perspectives*. Springer Science & Business Media.

Karvonen, A., Cugurullo, F., & Caprotti, F. (2019). *Inside smart cities: Place, politics and urban innovation*. Urban Innovation, Routledge, Abingdon.

Kitchin, R. (2015). Making sense of smart cities: addressing present shortcomings. *Cambridge Journal of Regions Economy and Society*, 8(1), 131-136. doi:10.1093/cjres/rsu027

Københavns Kommune (2012a). Cloudburst Management Plan. Retrieved April 4, 2020 from https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1018

Københavns Kommune (2012b). CPH 2025 Climate Plan. Retrieved March 3, 2020 from <https://urbandevopmentcph.kk.dk/artikel/cph-2025-climate-plan>

Københavns Kommune (2012c). Green Mobility Action Plan. Retrieved March 3, 2020 from https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1020

Københavns Kommune (2017a). Bicycle Support Priority Plan 2017-2025. Retrieved March 3, 2020 from <https://byudvikling.kk.dk/sites/byudvikling.kk.dk/files/cykelstiprioriteringsplan-2017-2025pdf-1620.pdf>

Københavns Kommune (2017b). Stormflood Plan. Retrieved March 3, 2020 from https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1656

Københavns Kommune (2019). Circular Copenhagen - Resource and Waste Plan 2024. Retrieved March 3, 2020 from https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1990

Komninos, N. (2013). *Intelligent cities: innovation, knowledge systems and digital spaces*. London: Routledge.

KPMG & Greater Paris Investment Agency (2019). Global Cities Investment Monitor 2019. Retrieved June 23, 2020 from <https://gp-investment-agency.com/wp-content/uploads/2019/06/GlobalCitiesInvestmentMonitor2019web-compressed.pdf>

- Kramers, A., Höjer, M., Lövehagen, N., & Wangel, J. (2014). Smart sustainable cities – Exploring ICT solutions for reduced energy use in cities. *Environmental Modelling & Software*, 56, 52-62. doi: <https://doi.org/10.1016/j.envsoft.2013.12.019>
- Land Berlin (2016). Berliner Energiewendegesetz (Energy Transition Act). Retrieved March 28, 2020 from http://gesetze.berlin.de/jportal/portal/t/k8c/page/bsbeprod.psml?pid=Dokumentanzeige&showdoccase=1&js_peid=Trefferliste&documentnumber=1&numberofresults=1&fromdoctoc=yes&doc.id=jlr-EWendGBErahmen&doc.part=R&doc.price=0.0#focuspoint
- Laufer, W. S. (2003). Social Accountability and Corporate Greenwashing. *Journal of Business Ethics*, 43(3), 253-261. doi:10.1023/A:1022962719299
- Lee, J. H., Hancock, M. G., & Hu, M. C. (2014). Towards an effective framework for building smart cities: Lessons from Seoul and San Francisco. *Technological Forecasting and Social Change*, 89, 80-99. doi:10.1016/j.techfore.2013.08.033
- Macke, J., Casagrande, R. M., Sarate, J. A. R., & Silva, K. A. (2018). Smart city and quality of life: Citizens' perception in a Brazilian case study. *Journal of Cleaner Production*, 182, 717-726. doi: <https://doi.org/10.1016/j.jclepro.2018.02.078>
- Martin, C. J., Evans, J., & Karvonen, A. (2018). Smart and sustainable? Five tensions in the visions and practices of the smart-sustainable city in Europe and North America. *Technological Forecasting and Social Change*, 133, 269-278. doi: <https://doi.org/10.1016/j.techfore.2018.01.005>
- Martínez, J. G., Boas, I., Lenhart, J., & Mol, A. P. J. (2016). Revealing Curitiba's flawed sustainability: How discourse can prevent institutional change. *Habitat International*, 53, 350-359. doi: <https://doi.org/10.1016/j.habitatint.2015.12.007>
- Matos, J. F., & Pedro, A. (2011). *O estudo de caso na investigação em educação-em direção a uma reconceptualização*. Paper presented at the Atas do XI Congresso da Sociedade Portuguesa de Ciências da Educação.
- Medeiros, M., Barbosa, R. J., & Carvalhaes, F. (2020). Educational expansion, inequality and poverty reduction in Brazil: A simulation study. *Research in Social Stratification and Mobility*, 66, 100458. doi: <https://doi.org/10.1016/j.rssm.2019.100458>
- Mercês, G., & Freire, N. (2017). Crise fiscal dos Estados e o caso do Rio de Janeiro. *Geo UERJ*; n. 31 (2017): Jul/Dez DO - 10.12957/geouerj.2017.32070.
- Mora, L., Deakin, M., & Reid, A. (2018). Smart City Development Paths: Insights From the First Two Decades of Research. In A. Bisello, D. Vettorato, P. Laconte, & S. Costa (Eds.), *Smart and Sustainable Planning for Cities and Region: Results of SSPCR 2017* (pp. 403-427). Cham: Springer.
- Mora, L., Deakin, M., & Reid, A. (2019). Strategic principles for smart city development: A multiple case study analysis of European best practices. *Technological Forecasting and Social Change*, 142, 70-97. doi:10.1016/j.techfore.2018.07.035
- Mori, K., & Christodoulou, A. (2012). Review of sustainability indices and indicators: Towards a new City Sustainability Index (CSI). *Environmental Impact Assessment Review*, 32(1), 94-106. doi:10.1016/j.eiar.2011.06.001

- Mosciaro, M., & Pereira, A. (2019). Reinforcing uneven development: The financialisation of Brazilian urban redevelopment projects. *Urban Studies*, 56(10), 2160-2178. doi:10.1177/0042098019829428
- Neumayer, E. (2003). *Weak versus strong sustainability: exploring the limits of two opposing paradigms*. Cheltenham: Edward Elgar Publishing.
- Nourry, M. (2008). Measuring sustainable development: Some empirical evidence for France from eight alternative indicators. *Ecological Economics*, 67(3), 441-456. doi: <https://doi.org/10.1016/j.ecolecon.2007.12.019>
- Nunes, F., & Melo, C. R. (2017). Impeachment, political crisis and democracy in Brazil. *Revista de Ciencia Política*, 37(2), 281-304. doi:10.4067/s0718-090x2017000200281
- Overman, E. S., & Boyd, K. J. (1994). Best practice research and postbureaucratic reform. *Journal of Public Administration Research and Theory*, 4(1), 67-83. doi:10.1093/oxfordjournals.jpart.a037195
- Patterson, J., Schulz, K., Vervoort, J., van der Hel, S., Widerberg, O., Adler, C., . . . Barau, A. (2017). Exploring the governance and politics of transformations towards sustainability. *Environmental Innovation and Societal Transitions*, 24, 1-16. doi: <https://doi.org/10.1016/j.eist.2016.09.001>
- Prefeitura do Rio de Janeiro (2017). Plano Estratégico da Cidade do Rio de Janeiro 2017-2020. Retrieved June 1, 2020 from <https://www.rio.rj.gov.br/ebooks/plano-estrategico/html5forpc.html?page=0>
- Register, R. (1987). *Ecocity Berkeley: building cities for a healthy future*. North Atlantic Books.
- Schuetze, T., & Chelleri, L. (2016). Urban Sustainability Versus Green-Washing—Fallacy and Reality of Urban Regeneration in Downtown Seoul. *Sustainability*, 8(1), 33.
- Senatsverwaltung für Stadtentwicklung und Umwelt (2015). Berlin Smart City Strategie. . Retrieved February 26, 2020 from https://www.smart-city-berlin.de/fileadmin/user_upload/PDFs/Strategie_Smart_City_Berlin.pdf
- Shatkin, G. (2007). Global cities of the South: Emerging perspectives on growth and inequality. *Cities*, 24(1), 1-15. doi: <https://doi.org/10.1016/j.cities.2006.10.002>
- Shelton, T., Zook, M., & Wiig, A. (2015). The 'actually existing smart city'. *Cambridge Journal of Regions Economy and Society*, 8(1), 13-25. doi:10.1093/cjres/rsu026
- Shmelev, S. E., & Shmeleva, I. A. (2019). Multidimensional sustainability benchmarking for smart megacities. *Cities*, 92, 134-163. doi:10.1016/j.cities.2019.03.015
- Siqueira-Gay, J., Gallardo, A. L. C. F., & Giannotti, M. (2019). Integrating socio-environmental spatial information to support housing plans. *Cities*, 91, 106-115. doi: <https://doi.org/10.1016/j.cities.2018.11.010>
- Söderström, O., Paasche, T., & Klauser, F. (2014). Smart cities as corporate storytelling. *City*, 18(3), 307-320. doi:10.1080/13604813.2014.906716

- Sodiq, A., Baloch, A. A. B., Khan, S. A., Sezer, N., Mahmoud, S., Jama, M., & Abdelaal, A. (2019). Towards modern sustainable cities: Review of sustainability principles and trends. *Journal of Cleaner Production*, 227, 972-1001. doi: <https://doi.org/10.1016/j.jclepro.2019.04.106>
- Solow, R. M. (1986). On the intergenerational allocation of natural resources. *The Scandinavian Journal of Economics*, 88(1), 141-149.
- Torrezan, R. G. A., & de Paiva, C. C. (2018). O Regime de Recuperação Fiscal: o déjà vu federativo.
- Townsend, A. (2013). *Smart cities: Big data, civic hackers, and the quest for a new utopia*. WW Norton & Company.
- Townsend, A. M. (2013). *Smart cities : big data, civic hackers, and the quest for a new utopia* (First edition. ed.). New York, NY: W.W. Norton & Company, Inc.
- UN Habitat (2017). Sustainable Urbanization in the Paris Agreement - Comparative Review of Nationally Determined Contributions for Urban Content. Retrieved November 20, 2019 from https://urban-leds.org/wp-content/uploads/2019/resources/guidance_and_tools/Integrated_climate_action/Sustainable%20Urbanization%20in%20the%20Paris%20Agreement%20-%20Comparative%20Review%20of%20NDC%20-%20July%202018.pdf
- United Nations (2015). Transforming our world: The 2030 agenda for sustainable development. A/RES/70/1. 21 October 2015. Retrieved November 20, 2019 from <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>
- United Nations (2018a). 2018 Revision of World Urbanization Prospects Report. Retrieved November 3, 2019 from <https://population.un.org/wup/>
- United Nations (2018b). The World's Cities in 2018 - Data Booklet (ST/ESA/ SER.A/417). Department of Economic and Social Affairs, Population Division. Retrieved November 3, 2019 from: https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf
- Valladares, L. (2000). A gênese da favela carioca. A produção anterior às ciências sociais. *Revista Brasileira de Ciências Sociais*, 15, 05-34.
- Vaz, L. F. (1994). Dos cortiços às favelas e aos edifícios de apartamentos—a modernização da moradia no Rio de Janeiro. *Análise social*, 581-597.
- Veselý, A. (2011). Arnošt Veselý: Theory and Methodology of Best Practice Research: A Critical Review of the Current State. *Central European Journal of Public Policy*, Vol. 5, pp 98–117.
- World Commission on Environment and Development (1987). Our Common Future - Brundtland Report. Retrieved November 20, 2019 from <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
- Yigitcanlar, T., & Kamruzzaman, M. (2018). Does smart city policy lead to sustainability of cities? *Land Use Policy*, 73, 49-58. doi: <https://doi.org/10.1016/j.landusepol.2018.01.034>

Yigitcanlar, T., & Teriman, S. (2015). Rethinking sustainable urban development: towards an integrated planning and development process. *International Journal of Environmental Science and Technology*, 12(1), 341-352. doi:10.1007/s13762-013-0491-x

Yigitcanlar, T., Han, H., Kamruzzaman, M., Ioppolo, G., & Sabatini-Marques, J. (2019). The making of smart cities: Are Songdo, Masdar, Amsterdam, San Francisco and Brisbane the best we could build? *Land Use Policy*, 88, 104187. doi: <https://doi.org/10.1016/j.landusepol.2019.104187>

Yigitcanlar, T., Kamruzzaman, M., Foth, M., Sabatini-Marques, J., da Costa, E., & Ioppolo, G. (2019). Can cities become smart without being sustainable? A systematic review of the literature. *Sustainable Cities and Society*, 45, 348-365. doi: <https://doi.org/10.1016/j.scs.2018.11.033>

Yin, R. (2009). *Case Study Research: Design and Methods*. Thousand Oaks, Calif: Sage Publications.

Zvolska, L., Lehner, M., Voytenko Palgan, Y., Mont, O., & Plepys, A. (2019). Urban sharing in smart cities: the cases of Berlin and London. *Local Environment*, 24(7), 628-645. doi:10.1080/13549839.2018.1463978

Websites

A New Direction (2020). Create Jobs London. Retrieved May 14, 2020 from <https://www.createjobslondon.org/employers/current-programmes>

ADFC Berlin (s/d). fLotte Berlin. Retrieved February 6, 2020 from <https://flotte-berlin.de/>

Agência Brasil (2019). Estado do Rio tem dívida de R\$ 118 bilhões com União, diz secretário. Retrieved May 30, 2020 from <https://agenciabrasil.ebc.com.br/politica/noticia/2019-08/estado-do-rio-tem-divida-de-r-118-bilhoes-com-uniao-diz-secretario>

Arcadis (2018). The Sustainable Cities Index Retrieved September 24, 2019 from [https://www.arcadis.com/media/1/D/5/%7B1D5AE7E2-A348-4B6E-B1D7-6D94FA7D7567%7DSustainable Cities Index 2018 Arcadis.pdf](https://www.arcadis.com/media/1/D/5/%7B1D5AE7E2-A348-4B6E-B1D7-6D94FA7D7567%7DSustainable%20Cities%20Index%202018%20Arcadis.pdf)

Assembleia Legislativa do Rio de Janeiro (2020). Fórum Permanente de Desenvolvimento Estratégico do Estado. Retrieved June 6, 2020 from <https://www.querodiscutiromeuestado.rj.gov.br/>

Astrup, S. (2019). Copenhagen wins - again - the place as the world's best cycling city. Politiken. Retrieved April 4, 2020 from <https://politiken.dk/indland/kobenhavn/art7271472/K%C3%B8benhavn-vinder-igen-pladsen-som-verdens-bedste-cykelby>

Berlin Schöneeweide (s/d). Retrieved February 2, 2020 from <https://www.schoeneweide.com/berlin-schoeneweide/historie/>

Bike Rio (s/d). Conheça o Bike Rio. Retrieved March 17, 2020 from: <https://bikeitau.com.br/bikerio/conheca-o-bike-rio/>

BRT (2019). Conheça o BRT. Retrieved March 17, 2020 from: <http://brt.rio/conheca-o-brt/>

BSR (2020). BSR-APP. Retrieved February 6, 2020 from <https://www.bsr.de/bsr-app-21371.php>

Bundesministeriums für Wirtschaft und Energie – BMWi (2020). The Energy Transition. Retrieved March 19, 2020 from <https://www.bmwi.de/Redaktion/EN/Dossier/energy-transition.html>

Business Insider (2016). Berlin and London are the hottest startup cities in Europe, but No. 3 is a rising star. Retrieved June 23, 2020 from <https://www.businessinsider.com/venture-capital-investments-in-european-startups-by-city-2016-7>

C40 Cities (2020). C40 Cities. Retrieved March 17, 2020 from: <https://www.c40.org/cities>

Câmara Municipal de Lisboa (2018, June 21). Lisboa é Capital Verde Europeia 2020. . Retrieved November 24, 2019 from <http://www.cm-lisboa.pt/noticias/detalhe/article/lisboa-e-capital-verde-europeia-2020>

Câmara Municipal de Lisboa (2019a). Bip/Zip Retrieved April 22, 2020 from <http://bipzip.cm-lisboa.pt/>

Câmara Municipal de Lisboa (2020). Lisboa Inteligente - Iniciativas. Retrieved April 22, 2020 from <https://lisboainteligente.cm-lisboa.pt/iniciativas/>

Câmara Municipal de Lisboa (s/d-a). Cidade de Lisboa. Retrieved April 22, 2020 from <https://www.lisboa.pt/>

Câmara Municipal de Lisboa (s/d-b). Lisboa Participa. Retrieved April 22, 2020 from <https://www.lisboaparticipa.pt/>

Câmara Municipal de Lisboa (s/d-c). Nova Praça de Espanha. Retrieved April 14, 2020 from <https://www.lisboa.pt/nova-praca-de-espanha>

CEPERJ (2017). Produto Interno Bruto do Estado do Rio de Janeiro. Retrieved May 30, 2020 from <http://www.ceperj.rj.gov.br/Conteudo.asp?ident=64>

City of London (2019). City History. Retrieved May 10, 2020 from <https://www.cityoflondon.gov.uk/things-to-do/visit-the-city/our-history/Pages/city-history.aspx>

CityLAB Berlin (s/d). CityLAB Berlin,. Retrieved February 6, 2020 from <https://www.citylab-berlin.org/>

Climate-KIC (s/d). Moabit West: Citizen engagement at the core of urban development plan. Retrieved February 2, 2020 from <https://www.climate-kic.org/success-stories/moabit-west-citizen-engagement-at-the-core-of-urban-development-plan/>

Companhia de Desenvolvimento Urbano da Região do Porto do Rio de Janeiro (2020). Porto Maravilha. Retrieved June 6, 2020 from <http://www.portomaravilha.com.br/conteudo/portomaravilha/2020portomaravilha.pdf? t=1585679460>

Conjur (2020). STF retira de pauta julgamento sobre distribuição de royalties do petróleo. Retrieved May 29, 2020 from <https://www.conjur.com.br/2020-abr-24/stf-tira-pauta-julgamento-partilha-royalties-petroleo>

Copenhagen Solutions Lab (2020). Copenhagen Solutions Lab. Retrieved March 03, 2020 from <https://cphsolutionslab.dk/>

Copenhagenize (2019). Copenhagenize Index. Retrieved April 4, 2020 from <https://copenhagenizeindex.eu/>

COR (s/d). Centro de Operações da Prefeitura do Rio. Retrieved March 17, 2020 from: <http://cor.rio/>

Danish Ministry of Climate Energy and Utilities (s/d). The climate initiative in Denmark. Retrieved April 3, 2020 from <https://en.kefm.dk/climate-and-weather/the-climate-initiative-in-denmark/>

Danmarks Statistik (2020). Population in Denmark. Retrieved April 3, 2020 from <https://www.dst.dk/en/Statistik/emner/befolkning-og-valg/befolkning-og-befolkningsfremskrivning/folketal>

Dicionário Michaelis (2020). Carioca. Retrieved May 19, 2020 from <https://michaelis.uol.com.br/moderno-portugues/busca/portugues-brasileiro/carioca>

European Central Bank (s/d). ECB euro reference exchange rate: Brazilian real (BRL). Retrieved May 28, 2020 from https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-brl.en.html

European Commission (s/d-a). Region Innovation Monitor Plus - Lisbon. Retrieved April 22, 2020 from <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/lisbon>

European Commission (s/d-b). Region Innovation Monitor Plus - London. Retrieved May 05, 2020 from <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/london>

Eurostat (2020). Gross domestic product (GDP) at current market prices by NUTS 2 regions. Retrieved May 28, 2020 from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10r_2gdp&lang=en

FoodCycle (2020). Food Cycle Project. Retrieved May 13, 2020 from <https://www.foodcycle.org.uk/>

Friendly Berlin (2020). Über Uns. Retrieved February 6, 2020 from <http://friendly-berlin.de/pages/ueber-uns/>

G1 (2019a). Prefeitura do Rio suspende Programa de Atenção Domiciliar ao Idoso. Retrieved June 6, 2020 from <https://g1.globo.com/rj/rio-de-janeiro/noticia/2019/07/15/prefeitura-do-rio-suspende-programa-de-atencao-domiciliar-ao-idoso.ghtml>

G1 (2019b). Rio mantém apenas três de oito restaurantes populares em funcionamento. Retrieved June 6, 2020 from <https://g1.globo.com/rj/rio-de-janeiro/noticia/2019/08/12/rio-mantem-apenas-tres-de-oito-restaurantes-populares-em-funcionamento.ghtml>

Greater London Authority (2020a). Digital Talent programme. Retrieved May 13, 2020 from <https://www.london.gov.uk/what-we-do/skills-and-employment/skills-londoners/digital-talent-programme/about-digital-talent-programme>

Greater London Authority (2020b). Homes for Londoners. Retrieved May 13, 2020 from <https://www.london.gov.uk/what-we-do/housing-and-land/homes-londoners-affordable-homes-programme-2016-21>

Greater London Authority (2020c). Mayor's Construction Academy. Retrieved May 13, 2020 from <https://www.london.gov.uk/what-we-do/skills-and-employment/skills-londoners/mayors-construction-academy/about>

Greater London Authority (2020d). Talk London. Retrieved May 13, 2020 from <https://www.london.gov.uk/talk-london/>

ICCAR (2019). International Coalition of Inclusive and Sustainable Cities. Retrieved March 17, 2020 from: <https://en.unesco.org/themes/fostering-rights-inclusion/iccar>

IESE (2018). IESE Cities in Motion Index. Retrieved November 24, 2019 from <https://media.iese.edu/research/pdfs/ST-0471-E.pdf>

Instituto Pereira Passos (2019). O Rio em síntese - Data.Rio. Retrieved June 29, 2020 from <http://www.data.rio/pages/rio-em-sntese-2>

International Energy Agency - IEA (2020). Germany 2020 - Energy Policy Review. Retrieved March 19, 2020 from <https://www.iea.org/reports/germany-2020>

KATWARN (s/d). KATWARN. Retrieved February 6, 2020 from <https://www.katwarn.de/en/>

Klimakvarter. (s/d). The Courtyard of the Future at Straussvej. Retrieved April 6, 2020 from <http://klimakvarter.dk/projekt/straussvej/>

Københavns Kommune (2020a). Sharing Copenhagen. Retrieved March 3, 2020 from <https://www.kk.dk/artikel/sharing-copenhagen>

Københavns Kommune (2020b). Status på København 2019. Retrieved April 3, 2020 from https://www.kk.dk/sites/default/files/status_paa_koebenhavn_2019.pdf

Københavns Kommune (s/d-a). Co-Create Copenhagen. Retrieved March 3, 2020 from <https://urbandevelopmentcph.kk.dk/artikel/co-create-copenhagen>

Københavns Kommune (s/d-b). Københavns Kommune. Retrieved March 3, 2020 from <https://www.kk.dk/>

Land Berlin (s/d). Mein Berlin. Retrieved April 14, 2020 from <https://mein.berlin.de/>

Lisboa E-nova (2019). Agência de Energia e Ambiente de Lisboa. Retrieved April 22, 2020 from <https://lisboaenova.org/>

Living Wage Foundation (s/d). London Living Wage. Retrieved May 13, 2020 from <https://www.livingwage.org.uk/>

London Power (s/d). London Power. Retrieved May 13, 2020 from <https://mylondonpower.com/>

Ministry of Foreign Affairs of Denmark (s/d). Nation of Cyclists. Retrieved April 4, 2020 from <https://denmark.dk/people-and-culture/biking>

Nave do Conhecimento (2020). Nave do Conhecimento. Retrieved June 6, 2020 from <https://navedoconhecimento.rio/>

Neue Mobilität Berlin (2019). Deine Sommerflotte. Retrieved February 6, 2020 from <http://neue-mobilitaet.berlin/summer-fleet-2019?lang=en/>

O Globo (2019a). Prefeitura do Rio reduziu em 77% as despesas com controle de enchentes nos últimos 5 anos. Retrieved May 11, 2020 from <https://g1.globo.com/rj/rio-de-janeiro/noticia/2019/02/07/prefeitura-do-rio-reduziu-em-77-as-despesas-com-controle-de-enchentes-nos-ultimos-5-anos.ghtml>

O Globo (2019b). RJ passa a ter quatro ex-governadores na cadeia ao mesmo tempo com prisão do casal Garotinho. Retrieved May 29, 2020 from <https://g1.globo.com/rj/rio-de-janeiro/noticia/2019/09/04/rj-passa-a-ter-quatro-ex-governadores-na-cadeia-com-prisao-do-casal-garotinho.ghtml>

O Globo (2019c). Sem repasses da prefeitura, programa Cegonha Carioca sofre sem combustível e com salários atrasados. Retrieved June 6, 2020 from <https://oglobo.globo.com/rio/sem-repasses-da-prefeitura-programa-cegonha-carioca-sofre-sem-combustivel-com-salarios-atrasados-24002888>

Office for National Statistics (2020a). Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland. Retrieved May 10, 2020 from <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/censusoutputareaestimatesinthelondonregionofengland>

Office for National Statistics (2020b). Regional gross domestic product all NUTS level regions. Retrieved May 10, 2020 from <https://www.ons.gov.uk/economy/grossdomesticproductgdp/datasets/regionalgrossdomesticproductallnutslevelregions>

Petrobras (2020). Pré-Sal. Retrieved May 28, 2020 from <https://petrobras.com.br/pt/nossas-atividades/areas-de-atuacao/exploracao-e-producao-de-petroleo-e-gas/pre-sal/>

Pordata (2019). População residente: total e por grandes grupos etários. Retrieved April 22, 2020 from <https://www.pordata.pt/Municipios/Popula%C3%A7%C3%A3o+residente+total+e+por+grandes+grupos+et%C3%A1rios-390>

Prefeitura do Rio de Janeiro (2011). Rio inaugura programa de Ônibus Híbrido & Elétrico da Clinton Climate Initiative. Retrieved June 26, 2020 from <http://www.rio.rj.gov.br/web/guest/exibeconteudo?id=1834502>

Prefeitura do Rio de Janeiro (2015). Minha Casa, Minha Vida. Retrieved June 6, 2020 from <http://www.rio.rj.gov.br/web/smhc/minha-casa-minha-vida>

Prefeitura do Rio de Janeiro (2018a). Comlurb sai na frente e lança primeira unidade de biometanização da América Latina. Retrieved June 6, 2020 from <http://www.rio.rj.gov.br/web/guest/exibeconteudo?id=8806038>

Prefeitura do Rio de Janeiro (2018b). Rio inicia elaboração de Plano de Ação Climática para zerar emissão de carbono. Retrieved June 26, 2020 from <http://www.rio.rj.gov.br/web/guest/exibeconteudo?id=8843554>

Prefeitura do Rio de Janeiro (2019). C40 dá destaque a medida tomada pelo Município para reduzir emissão de gases do efeito estufa. Retrieved June 26, 2020 from <https://prefeitura.rio/meio-ambiente/c40-da-destaque-a-medida-tomada-por-crivella-para-reduzir-emissao-de-gases-do-efeito-estufa/>

Prefeitura do Rio de Janeiro (2020). Prefeitura inspeciona obra do BRT Transbrasil, que vai beneficiar 800 mil usuários por dia. Retrieved June 6, 2020 from <https://prefeitura.rio/conservacao/prefeitura-inspeciona-obra-do-brt-transbrasil-que-vai-beneficiar-800-mil-usuarios-por-dia/>

Prefeitura do Rio de Janeiro (s/d-a). labGov.RIO. Retrieved June 6, 2020 from <http://www.rio.rj.gov.br/web/labgovrio>

Prefeitura do Rio de Janeiro (s/d-b). Participa Rio. Retrieved June 6, 2020 from <http://pds-pcrj.hub.arcgis.com/>

Prefeitura do Rio de Janeiro (s/d-c). Programa Mutirão Reflorestamento. Retrieved June 6, 2020 from <https://www.rio.rj.gov.br/web/smac/recuperacao-ambiental>

Prefeitura do Rio de Janeiro (s/d-d). Sistema Municipal de Informações Urbanas - SIURB. Retrieved June 8, 2020 from <https://siurb.rio/portal/home/>

Projeto Ruas (s/d). Projeto Ruas. Retrieved June 16, 2020 from <https://www.projeturuas.org.br/#iniciativas>

Revista Smart Cities (s/d). Smart Cities. Retrieved April 22, 2020 from <http://smart-cities.pt/>

Roland Berger. (2019). Smart City Strategy Index 2019. Retrieved November 24, 2019 from <https://www.rolandberger.com/en/Publications/Smart-City-Strategy-Index-Vienna-and-London-leading-in-worldwide-ranking.html>

Sharing Cities (s/d). Sharing Cities. Retrieved March 10, 2020 from <http://www.sharingcities.eu/sharingcities/about>

Smart City Berlin (2019). Smart City Berlin - hier entsteht Zukunft. Retrieved January 1, 2020 from <https://www.smart-city-berlin.de/en/home/>

Smart London (2020). Smarter London Together Report Card. Retrieved May 10, 2020 from <https://trello.com/b/CIoKi2mP/smarter-london-together-report-card>

Spacehive (2020) Crowdfund London. Retrieved May 13, 2020 from <https://www.spacehive.com/movement/mayoroflondon/>

State of Green (2016). Sustainable urban drainage systems. Retrieved April 4, 2020 from <https://stateofgreen.com/en/uploads/2015/10/Sustainable-Urban-Drainage-Systems.pdf?time=1585990507>

Statistik Berlin Brandenburg (2018). Statistiken. Retrieved March 10, 2020 from <https://www.statistik-berlin-brandenburg.de/Statistiken/inhalt-statistiken.asp>

Tech Invest (s/d). Tech Invest Programme. Retrieved May 14, 2020 from <https://techinvest.london/>

Tech London (s/d). Tech London. Retrieved May 14, 2020 from <https://tech.london/>

Tech Nation (2020). UK Tech for a Changing World - Tech Nation Report 2020. Retrieved May 14, 2020 from https://technation.io/wp-content/uploads/2020/03/Tech-Nation-Report-2020-UK-Tech-For-A-Changing-World-v1_0.pdf

Transport for London (2017). Healthy Streets. Retrieved May 13, 2020 from <http://content.tfl.gov.uk/healthy-streets-for-london.pdf>

Transport for London (s/d-a). Low Emission Zone (LEZ). Retrieved May 13, 2020 from <https://tfl.gov.uk/modes/driving/low-emission-zone>

Transport for London (s/d-b). Ultra Low Emission Zone (ULEZ). Retrieved May 13, 2020 from <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone>

Trust for London (s/d). London Key Facts. Retrieved May 12, 2020 from <https://www.trustforlondon.org.uk/data/key-facts-london-poverty-and-inequality/>

UKTN (2018). Why Berlin is becoming Europe's number one tech hub. Retrieved June 26, 2020 from <https://www.uktech.news/news/berlin-becoming-europes-number-one-tech-hub-20180905>

Umweltbundesamt (2020). Emission of greenhouse gases covered by the UN Framework Convention on Climate. Retrieved March 31, 2020 from <https://www.umweltbundesamt.de/en/indicator-greenhouse-gas-emissions#at-a-glance>

Urban Development CPH (s/d). Urban Development CPH. Retrieved April 10, 2020 from <https://urbandevelopmentcph.kk.dk/>

Veja Rio (2014). Ônibus elétrico nas ruas do Rio Retrieved June 26, 2019 from <https://vejario.abril.com.br/cidade/onibus-eletrico-ruas-rio/>

Walker, P., Mason, R., & Carrington, D. (2019, Jun 11). Theresa May commits to net zero UK carbon emissions by 2050. *The Guardian*. Retrieved from

<https://www.theguardian.com/environment/2019/jun/11/theresa-may-commits-to-net-zero-uk-carbon-emissions-by-2050>

World Bank (2020a). Civil Society Overview. Retrieved April 19, 2020 from <https://www.worldbank.org/en/about/partners/civil-society/overview>

World Bank (2020b). GINI Index. Retrieved May 11, 2020 from <https://data.worldbank.org/indicator/SI.POV.GINI?end=2018&start=2016>

Annexes

I. Annex A - Initiatives

A: Industry; **B:** Government; **C:** Civil Society; **D:** Scientific Community; **E:** Other / **1:** Energy; **2:** Air; **3:** Water; **4:** Waste; **5:** Green & Public Spaces; **6:** Mobility & Transport; **7:** Residential Buildings & Districts; **8:** Public Health; **9:** Social Inclusion & Diversity; **10:** Culture; **11:** Education; **12:** Accessibility; **13:** Public Safety & Security; **14:** E-Government; **15:** Industrial Districts & Business Accelerators; **16:** Digital Infrastructure & Solutions; **17:** Other.

Berlin

Table A1

Berlin's Initiatives

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	arc32 (BSR)		1							1								1					
2	Real Time Data Hub				1			1	1	1		1								1			1
3	The "See-Meile"-Project in Berlin Adlershof	1	1		1		1					1											1
4	Combifuel filling station	1					1					1											
5	Adlershof Former Solon Building	1					1		1				1									1	
6	Adlershof Glass CHP plant	1					1																
7	Adlershof Institute of Physics		1		1		1		1				1										
8	Adlershof LED outdoor lighting	1					1						1										1
9	Adlershof Newton project	1					1						1					1					
10	Adlershof Smartgrid Alliance (refrigeration network)	1			1		1						1										
11	Algae Facade Reactor MINT Engineering	1					1	1	1														

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
12	Allotment Garden "POG" (Potsdamer Güterbahnhof)			1							1				1								
13	BentoBox	1					1					1											
14	Beratungsstelle SolarZentrum Berlin		1	1			1										1						
15	Berlin Central Station LoRaWAN Gateway	1	1									1					1					1	
16	Berlin Schöneeweide	1	1	1	1		1	1	1		1	1				1	1				1	1	
17	Berlin TXL - The Urban Tech Republic	1		P	1		1	1	1	1	1	1	1	1	1	1	1				1		
18	Berlin-Kreuzberg 1 Repair Café			1						1						1	1						1
19	Berliner Stadtreinigung AöR Biogas Plant West		1							1		1											
20	Berliner Stadtreinigung AöR Ruhleben waste-to-energy plant		1				1			1													
21	Berliner Wasserbetriebe Maintenance and repair (AUZUKA)	1	1		1				1													1	
22	Berliner Wasserbetriebe Sewage Treatment Plant		1				1		1														
23	Berliner Wasserbetriebe Wastewater Centre		1						1													1	
24	Biotech-Campus Berlin-Buch		1	1	1									1			1						
25	Britz Castle with park and manor house			1			1								1	1	1						
26	BSR-App		1	P						1							1	1		1		1	
27	Chargomat	1																					1
28	Circular Economy House (CRCLR)	1		1	1					1							1				1		
29	City-friendly mobility by using automated minibuses	1	1		1		1					1										1	

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
30	CityLab Berlin Clean Tech Business		1	1			1	1			1	1					1			1	1	1	
31	Park Berlin- Marzahn	1					1		1	1		1									1	1	
32	Co-Working Space betahaus	1			P										1		1	1					
33	degewo Future House	1					1						1									1	
34	Deine Sommerflotte	1	1		1							1											
35	DIGINET-PS DIN SPEC 91357 Reference	1	1		1							1										1	
36	Architecture Model Open Urban Platform (OUP) Distribut(e): A				1															1		1	
37	green supply chain for the city of tomorrow	1			1		1					1											
38	Door2Door	1										1										1	
39	Drinking fountain Refill Berlin		1						1	1													
40	Dycle Electrically powered			1						1													
41	solar ferries F11 Stop Müggelwerderweg		1				1					1											
42	Electrically powered solar ferries F12 Stop Müggelbergallee			1			1					1											
43	Electrically powered solar ferries F21 Stop Krampenburg		1				1					1											
44	Electrically powered solar ferries - F11 Stop Baumschulenstrasse		1				1					1											
45	ELEKTRAI	1	1		1		1	1				1											
46	ELEVATE Delta	1	1		1										1			1				1	
47	eMobility-Scout Energetic renovation	1	1		1		1					1										1	
48	Botanical Garden and Botanical Museum Berlin		1		1		1																
49	Energie-audiTOUR		1				1										1						

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
50	ENERGY IN MOTION@TU Berlin		1		1		1	1	1							1	1						
51	Energy net Adlershof	1	1		1		1															1	
52	EUREF-Campus	1	1		1		1	1	1	1		1	1								1	1	
53	EUREF-Campus Green Garage	A	A					1													1	1	
54	EUREF-Campus ubitricity	1					1					1										1	
55	EUREF-Power Station by GASAG Solution Plus	1					1										1						
56	European Data Portal		1		1															1		1	
57	Everybody, listen up! Acoustic passenger information to be tested		1	P								1						1					
58	FLEXCoop	1			1		1															1	
59	Flussbad Berlin Flussbad-Garten		1						1		1												
60	Fr)endly Berlin				1											1	1	1				1	
61	FUBIC - Campus Dahlem	1	1		1										1							1	
62	Future Living® Berlin	1	1				1	1	1			1	1		1				1			1	
63	Gelbes Viertel Hellersdorf	1	1				1						1		1								
64	German Museum of Technology Green Globe		1														1	1					
65	Stadion Olympiastadion Berlin		1				1	1	1	1		1			1			1				1	
66	Green Moabit	1	1	1	1		1	1	1		1	1	1			1	1					1	
67	GreenPack Akku	1					1					1											
68	Haus der Zukünfte Futurium				1										1			1	1				
69	Heat from wastewater: Teaching and Sports Swimming Pool Schöneberg Berliner Wasserbetriebe		1				1	1	1	1	1												1

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
70	Hybrid Electric Fire Engine of the Berliner Feuerwehr	1	1				1	1	1														
71	ImplaN - Initial infrastructure for hydrogen mobility based on predictable demand	1	1		1		1	1	1				1										
72	Independent Experimentation Indoor Swimming			1														1					
73	Pool Finckensteinallee		1				1	1	1			1		1				1					
74	Information and Competence Centre for Future-Oriented Building		1			1	1	1						1			1	1					
75	InfraLab Berlin	1	1		1		1	1	1	1	1		1					1		1		1	1
76	INLOVE		1	1					1				1			1		1					
77	Innovative street lighting	1	1		1		1	1						1									1
78	Integration Über den Tellerrand Intelligent mobility station: Theme			1													1	1					
79	station "Linked Mobility and Energy" (IMS)	1	1		1		1	1	1				1										1
80	Interactive Exhibition NormenWerk – DIN e. V.	1		1			1	1										1					1
81	Interative App Time Travel Potsdamer Platz	1		1													1	1					1
82	KATRETTER	1	1	1	1																		1
83	KATWARN KoMoDo -	1	1	P	1									1					1	1		1	
84	cooperative use of micro-depots	1	1				1	1				1											
85	Lisa (Guidance- and Information System Wastewater) in Friedrichshain		1		1				1	1												1	
86	LoRaWAN sensor network	1	1		1		1	1	1	1		1	1						1			1	

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Low-Energy																						
87	Housing Estate Märkisches Viertel		1				1	1					1										
88	Malzfabrik	1					1		1				1			1	1						
89	Malzfabrik	1																					1
	Aquaponic																						
90	Marienfelde Quarter	1					1	1					1										
	Mariengrün																						
91	meinBerlin	1		1																1		1	
92	MEISTER	1	1	1	1		1					1	1										
93	Mobile Vielfalt statt Privat-Pkw	1	1	1	1		1	1				1											
94	Model Apartment		1											1	1			1					1
	Pflege@Quartier																						
95	Morgenstadt	1	1		1		1	1	1	1	1	1	1						1	1	1	1	
	Märkisches Viertel																						
96	Cyber Seniors		1	1												1		1	1				1
97	New Mobility Berlin	1	1	1	1		1	1				1											
98	perto	1	1				1																
99	Pole Position	1	1				1					1										1	
100	Quartier	1					1	1	1	1	1		1								1	1	
	Heidestraße																						
101	Radbahn			1			1				1	1											
	Red Town Hall																						
102	solar power plant of Berliner	1	1				1	1															
	Energieagentur																						
103	Residential building	1	1	1			1	1					1										
	Lindenhof																						
104	Route Charge	1	1		1		1	1				1											
	SAFARI -																						
105	Automated driving in Berlin	1	1		1							1								1		1	
106	Schlüsselerlebnis Sommerflotte	1	1	1	1		1	1				1											
107	Schumacher Quartier	1	1	1	1		1	1	1		1	1	1			1	1					1	
	Science and																						
108	Technology Park	1	1		1		1	1	1	1			1				1				1	1	
	Adlershof																						
109	SENSARE	1	1		1				1	1		1							1			1	
110	SimRa: Safety in Bicycle Traffic			P	1							1										1	
111	Sleep & Charge	1	1				1					1											
112	Smart Business District		1				1	1	1	1	1	1			1						1		
113	Smart Life Lab		1	1			1						1				1					1	

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
114	Smart Streets		1		1		1				1							1		1		1	
115	Smart Urban Farming	1		1					1	1												1	1
116	Social and Green IT - AfB			1						1					1			1				1	
117	Social-ecological gardening in Berlin-Wedding			1							1				1								1
118	Sonnenrepublik	1					1															1	
119	Stadtquartier 4.0	1	1		1		1	1				1									1	1	
120	Startup Hub The Place														XXXXXXX								
121	Station of the future		1				1			1		1										1	
122	STREETLIFE	1	1	P	1			1					1									1	
123	Studio TILL IT’S IN TATTERS (BIS ES MIR VOM LEIBE FAELLT)			1							1					1	1						1
124	Subterranean supply- and disposal centre at the Potsdamer Platz	1					1			1	1												
125	Sustainable urban logistics - Kabelsalat-Berlin	1	1				1	1				1										1	
126	Technology Park Humboldthain	1	1		1																1	1	
127	Tempelhof Airport is to be the location for a creative economy		1								1				1	1	1						
128	The BVG and their emission-free e-buses	1	1		1		1	1				1											
129	The City Is Open Source (Today “Hackers Closing Loops”)			1						1	1	1	1			1	1						1
130	The Experience Room Gemeinsam Digital	1			1												1					1	
131	The Urban City-Park														XXXXXXX								
132	Treskow Courtyards	1									1		1		1			1					
133	Wheelmap Pro			1														1				1	

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
134	WindNODE - Showcase Branch Store Lidl	1	1		1		1										1					1	
135	WindNODE - Showcase Branch Store Kaufland	1	1		1		1										1					1	
136	WindNODE - Showroom Energy Transition	1	1		1		1										1					1	
137	WindNODE Showroom Siemens	1	1		1		1										1					1	
138	Your tip for trips without a car Your vegetable			1							1	1										1	
139	garden online - IPGarden	1																				1	1
140	ZeemoBase Micro Smart Grid	1	1		1		1					1										1	
141	Zentrum. Labor. Experimentierfeld. CityLAB Berlin		1	1			1				1	1				1	1			1		1	
142	Zero Waste Shop	1								1													1
143	Citizen's Services Portal (ServiceStadt)		1	P																1		1	
144	City Cycling Berlin Campaign		1	1			1					1											
145	diBEK		1																	1		1	
146	Free Rentable Cargo Bikes (Flotte-Berlin)					1																	
147	New Berlin Air	1	1	1	1		1	1				1										1	
148	Nextbike System RAMONA:	1	1					1				1										1	
149	Realization of automated mobility concepts in local public transport		1		1		1	1				1										1	
150	Smart eFleets	1	1		1		1	1				1											
151	VBB Bus & Bahn- Begleitservice	1	1									1						1					

Copenhagen

Table A2

Copenhagen's Initiatives

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Åbne haver		1	1				1			1												
	Adaptation of non-																						
2	road mobile		1				1	1															
	machinery																						
3	Amagerværket		1				1	1		1													
	Biomass Power Plant																						
4	Begrønningsværktøj	1	1								1												
5	BikeSim	1	1									1										1	
6	Blaffarnationen		1	1				1			1					1							
	blafferstoppesteder																						
7	Bliv Hørt!		1	1															1		1		
8	Bycyklen	1	1	P		1	1	1				1									1		
																						1	
9	Bygningsfornyelsen i	1	1				1	1	1		1		1										
	Klimatevarterer																						
10	Byhøst		1	1							1					1						1	1
11	Carbon neutral		1				1	1				1											
	municipal transports																						
12	Carl Nielsen Allé	1	1					1	1		1								1				
	Charging stations for																						
13	electrical and	1	1				1	1				1											
	hydrogen-powered																						
	cars																						
14	City Data Exchange	1	1																			1	
15	Citylogistik	1	1		1		1	1				1											
16	Cityringen		1				1					1										1	
17	Clever APP	1																				1	
18	Climate Ambassadors		1														1						
	Initiative																						
19	Co-create																						
	Copenhagen /	1	1	1	1		1	1	1	1	1	1	1		1	1	1						
	Community																						
	Copenhagen																						
20	Collaboratorium		1	1			1	1	1								1						
	Copenhagen																						
21	Intelligent Traffic	1	1		1							1										1	
	Solutions - CITS																						
22	Copenhagen Package		1	p			1						1									1	
	for Citizens																						
23	Copenhagen Solutions		1																			1	
	Lab																						
24	Cykelpartnerskab	1	1		1		1	1				1											

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
25	Danish Outdoor Lighting Lab (DOLL)	1	1		1		1	1				1										1	
26	Delebiler København	1	1				1	1				1											
27	Din Offentlige Transport - DOT		1									1										1	
28	Eco-driving with Green-catch APP	1	1									1										1	
29	Eletrification of 2A and 18 bus lines		1				1					1											
30	En havn af muligheder	1	1	P				1	1		1			1		1					1		
31	Energi & Vand Science Center		1	P			1	1	1								1						
32	Energi & Vand Living Lab		1	P			1	1	1								1						
33	Energispring (Energy Jump)	1	1	1			1						1									1	
34	Energy and CO2 Account	1	1	1	1		1	1														1	
35	Energy Lab Nordhavn	1	1		1		1	1				1	1									1	
36	EnergyBlock		1		1		1															1	
37	Enghaveparken Renovation	1	1						1		1								1				
38	Fleksible Garderum		1								1	1										1	
39	Førerløs bus	1	1	1								1										1	
40	Free parking for shared, electric and hydrogen powered vehicles		1				1	1				1											
41	Fremtidens Gårdhave Askøgade	1	1	1				1	1		1								1				
42	Fremtidens Gårdhave Skt. Kjelds Plads	1	1	1				1	1		1								1				
43	Fremtidens Gårdhave Straussvej	1	1	1				1	1	1	1								1				
44	Fremtidens Gårdhave Tomsgårdsvej	1	1	1				1	1		1								1				
45	Fuel Conversion of Buses		1				1	1				1											
46	Future Rail Operations	1	1									1										1	
47	Gårdhave Ved Otto Mallins Gade	1	1	P				1	1		1								1				
48	Genveje for Cyklister		1									1											
49	Grønne Sti		1					1			1	1											
50	Grønt Hjørne på Helsingborggade		1					1			1												
51	Grønt Indgangsparti	1		1				1			1												

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
52	Grønt tag på Thomas Laubsgade	1	1				1				1												
53	Grønt Trafikløsning Æbeløgade	1					1				1												
54	Haralds Plad renovation	1					1	1			1								1				
55	Havvindmøller and Lanvindmøller	1					1	1														1	
56	HOFOR Showroom	1	P				1	1	1								1						
57	Hovedstadens Letbane	1					1						1										
58	Intelligent data-anvendelse i Smart Cities (IDASC)	1	1		1																	1	
59	Kalvebod Brygge tunnel	1	1						1										1				
60	Kildevældsparken Renovation	1	1	P				1	1		1								1				
61	Klimakvarter Østerbro	1	1	1			1	1	1		1		1						1				
62	KlimatKarré	1	1	1			1	1	1		1		1						1				
63	Kulturcenter Kildevæld	1	1					1			1				1	1	1						
64	Lighting Metropolis - Green Economy	1	1		1		1				1			1		1						1	
65	Maritime Nyttehaver	1	1	1													1						1
66	Mobility as a Service (MaaS)	1	1									1										1	
67	MobiMaestro	1	1									1										1	
68	Moving People	1	1		1			1				1											
69	Nordic Smart City Network		1									1										1	
70	Nyt Bynet		1									1											
71	Open Data DK		1																	1		1	
72	Østerbro Tunnel	1	1						1										1				
73	Path over Svanemølle Kaserne	1	1					1			1												
74	Plusnet		1									1											
75	Pop Up Farm Nørrebro	1	1	1	1												1						1
76	Project Air View	1	1		1			1															
77	Projektet FUTURE	1	1		1		1	1														1	
78	REEL - Ren Energi Lolland	1	1		1		1	1															
79	Regional Data Hub	1	1		1															1		1	
80	Renovation and greening of Bryggervangen Street	1	1	1				1	1		1								1				

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
81	Renovation and greening Tåsingevej street and square	1	1	1				1	1		1								1				
82	Renovation of Municipal Buildings		1				1	1	1					1									
83	Scandinavian Green Procurement Alliance on Non-Road Mobile Machinery	1	1		1		1	1															
84	Select for Cities	1	1																			1	
85	Sharing Copenhagen	1	1	1				1	1		1				1	1					1		
86	Smart Cities Accelerator - SCA	1	1		1		1	1														1	
87	Smart City Cluster Denmark	1	1	1	1																	1	1
88	Smart Parking Copenhagen		1									1										1	
89	Smarter District Heating	1	1				1		1					1								1	
90	Store varmepumper til fjernvarme - SVAF	1	1		1		1	1	1					1								1	
91	Street Lab	1	1				1	1		1	1	1										1	
92	Supercykelstier Sydhavn		1									1											
93	Genbrugscenter Laboratorium		1	P						1							1						
94	Tagfarmen Østergro				1						1						1						1
95	Tåsinge Plads	1	1					1	1		1								1				
96	Trafiktårnet Øst	1	1										1									1	
97	Underbroen - Under the Bridge			1	1											1	1					1	1
98	Valby tunnel	1	1						1										1				
99	Vandposte i København			1					1														
100	Vi Cykler til Arbejde	1			1			1				1				1	1						
101	Water Smart Cities	1	1	1	1				1										1				1

Lisbon

Table A3

Lisbon's Initiatives

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	A Rua é Sua		1								1	1				1							
2	Academia de Comércio	1	1																		1		
3	Água+		1						1														
4	APP Carris		1									1										1	
5	Aqui Há Mais Bairro		1				1		1		1		1					1					
6	Atlas Social de Lisboa Online	1	1		1								1		1		1					1	
7	Autocarros Limpos		1				1	1				1											
8	Bebedouros de Lisboa		1	1					1		1							1					
9	Bike Buddy			1								1											
10	BIP/ZIP Program	1	1	1				1	1	1	1	1	1	1	1	1	1	1		1			
11	Carreiras de Bairro		1									1											
12	CEMOWAS2			1	1				1	1													
13	Centro de Inovação da Mouraria		1																		1		
14	Centro Operacional Integrado de Lisboa (COI)	1	1																1			1	
15	Centro Qualifica + Valor Lx		1														1						
16	Cidade Ciclável			1								1										1	
17	Clube Alfacinha		1	1										1									1
18	Clubes de Mar		1	1	1									1									1
19	Corredores Verdes		1				1	1	1		1	1											
20	Crescer Saudável		1	P										1			1						
21	C-Roads	1	1									1							1			1	
22	Desporto Mexe Comigo		1	1										1	1								1
23	É Habitação		1	P									1						1				
24	Ecolisboa	1	1							1												1	
25	Escola Nova		1															1					1
26	Fablab Lisboa	1	1			1									1		1				1	1	1
27	GIRA		1				1	1				1										1	
28	H2O Quality		1						1													1	
29	Habitar Lisboa		1										1		1								
30	Hora do Código		1	P														1				1	
31	Horta na Escola		1	P							1			1			1						1
32	Hub Criativo do Beato / Startup Lisboa	1	1																		1		
33	Iluminação Funcional Ponte 25 de Abril	1					1	1			1												

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
34	Jovens Repórteres para o Ambiente		1	1													1						1
35	Letras, cores e saberes		1	P													1						
36	LIFE		1				1						1		1			1				1	
37	LIFE Index-Air		1		1		1							1								1	
38	Lisboa +55		1	1										1			1						1
39	Lisboa a Compostar		1	1						1							1						
40	Lisboa Aberta	1	1	1	1														1			1	
41	Lisboa Ciclável		1					1					1										
42	Lisboa Empreende		1																		1		
43	Lisboa Não Para!	1	1	1							1				1								1
44	Lisboa Participa		1	1															1			1	
45	Lisboa Robotics Cluster	1	1	1	1																1	1	
46	Lisboa Sabe Nadar		1	P											1								1
47	Lisboa Verde		1	P			1	1	1	1	1						1						1
48	Lisbon City Council smart grid pilot	1	1		1		1	1				1										1	
49	LisCool	1	1		1		1	1														1	
50	Literacia Digital		1	P													1					1	
51	Lojas com História	1	1	1	1												1						
52	Lotes ComVida		1	1								1		1		1	1						
53	Lx Analytics Hub	1	1																1			1	
54	LxDatLab		1		1		1		1			1	1						1			1	
55	Made of Lisboa	1	1	1																	1		
56	Meep	1	1									1										1	
57	Mercado Oficinas																						
57	Mercado do Bairro Alto (MOBA)		1	1																	1		
58	Mil Pássaros		1	P		1											1	1					
59	Mobi.e Network	1	1				1	1				1										1	
60	Modelo Tridimensional da Ocupação Superficial do Concelho de Lisboa	1	1																			1	
61	Mov'in		1	1											1				1				1
62	Na Minha Rua Lx		1	1																1		1	
63	Novas Acessibilidades às Colinas do Castelo		1									1	1			1			1				
64	Observatórios Lisboa		1	1			1	1	1													1	
65	Olipsíadas		1	P											1								1
66	Orquestra Geração	1	1	1												1	1	1					
67	PARK4SUMP		1	1									1										
68	Parque Urbano da Praça de Espanha	1	1						1	1		1	1										
69	Partilha Lisboa	1	1	1			1	1				1										1	
70	Passaporte Escolar		1	P													1	1					
71	Pavimentar Lisboa		1							1	1	1	1						1				
72	Pela Cidade Fora		1	P								1						1					
73	Plataforma das Lojas Sociais de Lisboa		1														1					1	

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
74	Plataforma de Gestão Inteligente de Lisboa (PGIL)	1	1								1							1				1	
75	Porta Aberta		1	1											1								1
76	Porta-a-Porta		1								1			1			1						
77	Praia Campo Sênior		1							1			1	1									
78	Programa Eco-Escolas		1	1			1	1	1	1		1		1			1						
79	Programa Ecovalor	1	1	1						1							1						
80	Projeto Radar		1	1										1								1	
81	Projeto UP - Upcoming Energies	1					1	1		1		1								1	1		
82	Projeto VoxPop	1	1	1							1												
83	Re:Costura			1						1						1	1						1
84	Reabilita Primeiro Paga Depois		1										1					1		1		1	
85	Repair Café Lisboa			1						1						1	1						1
86	Requalificação do Paço do Lumiar		1				1	1	1	1	1	1	1										
87	Rewind Cities Lisbon	1	1													1						1	
88	Saúde Porta a Porta	1	1	1	1									1	1			1					
89	Schröder Hyperion	1	1				1	1			1											1	
90	Secundário para todos		1												1		1						
91	Sensorização do Eixo Central		1					1			1											1	
92	Sensorização dos Depósitos Coletivos de Resíduos	1	1							1												1	
93	Serve the City	1	1	1												1							1
94	Serviço Mobilidade Reduzida especial		1									1						1					
95	Sexta de Bicicleta			1								1											
96	Sharing Cities: Gestão de Energia e retrofit	1	1	1	1		1	1														1	
97	Sharing Cities: Iluminação Pública	1	1	1	1		1	1			1	1										1	
98	Sharing Cities: Mobilidade Elétrica	1	1	1	1		1	1				1										1	
99	Sharing Cities: USP	1	1	1	1		1	1		1	1	1										1	
100	Sistema de Gestão de Remoção de Resíduos		1						1											1		1	
101	Smart Open Lisboa (SOL)	1	1	1			1	1	1	1	1	1	1	1				1			1	1	
102	SoLis		1	1			1	1									1					1	
103	SUSHI	1	1	1					1	1	1	1						1			1	1	
104	Teleassistência		1	1										1				1				1	
105	Transporlis / Lisboa Viagem APP	1	1									1										1	
106	Uma praça em cada bairro		1							1	1												
107	Urban Co-Creation Data Lab (UCD Lab)	1			1		1	1	1		1								1				

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
108	Urbanismo Digital		1																	1			1
109	Viva	1	1									1											
	Water Optimization																						
110	for Network		1						1														1
	Efficiency (WONE)																						
111	Waterbeep		1							1													1
112	WIFI nos Mercados		1																				1
113	ZER Avenida Baixa																						
	Chiado		1				1	1				1	1										
114	Zonas 30		1					1				1	1	1	1				1				

London

Table A4

London's Initiatives

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Acessible Housing Locator	1											1				1					1	
2	Active Londoners	1	1											1									
3	Air Quality Modelling		1		1		1															1	
4	AirtText	1	1		1		1						1									1	
5	Better Futures		1				1		1												1	1	
6	Breathe London	1	1	1			1															1	
7	Bunhill Heat and Power Network (BHPN) phase 2	1	1		1		1	1					1										
8	Busk in London		1	1												1					1		
9	Care and Support Specialised Housing programme		1										1	1				1					
10	Circular Fashion Fast Forward	1	1							1											1		
11	Circular London		1	1						1											1		
12	City Data Analytics Programme		1																1			1	
13	City of London Community Energy		1	1			1	1							1		1						
14	City of London: Smart street light	1	1				1															1	
15	City Tools: London	1	1	1																		1	
16	Clean Air Route Finder	1	1		1		1					1											
17	Cleaner Vehicle Checker		1	1			1					1										1	
18	Community Water Management for a Liveable London (CAMELLIA)	1	1	1	1				1														
19	Connected London	1	1																			1	
20	Create Jobs London	1	1	1	1										1	1	1				1	1	
21	Creative Enterprise Zone		1													1					1		
22	Crowdfund London		1	1																			1

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
23	Cultural Infrastructure Map		1													1						1	
24	Cycleways Expansion		1								1	1											
25	Dial-a-Ride		1								1						1						
26	Digital Talent programme	1	1	1												1	1				1	1	
27	DigitalHealth.London	1	1	1	1									1							1	1	
28	D-Risk	1	1		1						1								1			1	
29	East Bank Project	1	1	1	1						1	1	1			1	1	1					
30	E-Flex	1	1		1		1					1										1	
31	Electric delivery vehicle trial	1	1				1	1				1											
32	Electric Vehicle Car Club	1	1				1	1				1										1	
33	Eletric charging points expansion	1	1				1	1				1											
34	Energy Garden	1	1	1			1	1			1			1	1		1						
35	English for Speakers of Other Languages (ESOL)		1	1												1		1					
36	eRCV I - Greenwich	1	1		1		1	1			1		1									1	
37	eRCV II - Sheffield and Westminster	1	1		1		1	1			1		1										
38	EV Charge Points Map		1				1					1										1	
39	Farm Start	1	1	1							1					1		1					1
40	FlexLondon		1				1	1														1	
41	Flipside	1	1	1	1											1		1			1	1	
42	Foodcycle	1		1						1						1							1
43	Future Startup Now	1	1	1												1		1			1	1	
44	Give it a Grow		1	1							1							1					1
45	Good Food Retail		1	1											1	1					1		1
46	Good Growth by Design	1	1	1	1						1	1	1									1	
47	Good Gym	1		1											1	1							
48	Good Thinking		1												1							1	
49	GovTech London		1																	1	1	1	
50	GovWifi/Govroam		1	1																1		1	
51	Green Infrastructure Focus Map		1								1											1	
52	Greener City Greenwich		1	1							1												
53	Estates Renovation	1	1	1	1		1	1						1									

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
54	Grey to Green	1	1				1	1		1													
55	Growing Communities Growup			1																		1	
56	Community Farms	1							1								1						1
57	Guerrilla Gardening			1						1													
58	Hanwell and Norwood Green Orchard Trail	1	1							1													
59	HeadStart Action	1	1												1						1		
60	Healthy Early Years London	1												1									
61	Healthy Schools London	1												1									
62	Healthy Streets Toolkit	1	P				1	1	1	1	1	1	1					1	1				
63	Heat Risk in London	1	1	1	1					1	1		1										1
64	Holborn gyratory makeover	1					1				1		1					1					
65	Home Response Homelessness	1	1	1			1	1														1	
66	Change and Platform for Life programme	1											1		1								
67	Homes for Londoners	1											1		1								
68	HS2	1									1												
69	iBus	1									1											1	
70	Kingston Pound	1	1																		1	1	
71	Lambeth Community Solar	1	1				1	1							1		1						
72	License Lite	1					1																
73	Liveable Neighbourhoods	1	1					1			1	1											
74	Living Under One Sun	1	1	1	1					1			1	1			1						1
75	LocalGov Digital	1																	1			1	
76	LoCITY	1	1				1	1			1										1		
77	London Borough of Culture	1														1							
78	London Business Climate Leaders	1	1	1			1	1		1	1												
79	London Co-Investment Fund	1	1																		1	1	
80	London Community Energy Fund	1	1				1	1															
81	London Connectivity Map	1																				1	

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
82	London Data Trust		1	1																			1
83	London Datastore		1		1															1		1	
	London Development Database (LDD)		1																	1		1	
84	Automation Project																						
85	London Digital Security Centre		1																1			1	
86	London Food Poverty Campaign		1	1											1								1
87	London Growth Hub		1																		1		
88	London Heat Map		1				1															1	
89	London Infrastructure Map		1				1	1	1	1	1	1	1	1			1			1	1	1	
90	London Living Wage	1	1	1												1					1		
	London Office for Rapid Cibersecurity Advancement (LORCA)	1	1	1	1														1			1	
92	London Power	1	1				1	1								1					1		
93	London Rents Map		1	1									1									1	
94	London Road Lab	1	1									1		1				1				1	
95	London School Atlas		1															1				1	
	London Sustainable Drainage Proforma		1						1														
97	London Together		1	1											1	1							
98	London Tree and Woodland Awards		1	1							1												
99	London Ventures	1	1																	1	1		
100	Low Emission Zones (LEZ)		1				1	1				1		1									
101	Making for Change: Waltham Forest		1	1	1					1						1					1		
	Mayor of London's Civic Innovation Challenge	1	1	1																	1	1	
103	Mayor's Construction Academy		1		1											1		1			1		
104	Mayor's Entrepreneur Competition		1				1	1	1	1	1	1	1	1		1			1		1	1	
105	Model City	1	1	1											1	1							
106	Moving On Up		1	1												1		1			1		

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
107	Natural Capital Account		1	1			1	1		1		1	1									1	
108	North Kensington Community Energy		1	1			1	1							1		1						
109	Northern line extension			1								1	1								1		
110	One London	1	1	1	1									1								1	
111	Open Data Camden			1																1		1	
112	Open Project System (OPS)			1																1		1	
113	Our Content - Change the Game			1											1						1		
114	Our Time			1											1								
115	Project Endeavour Queen Elizabeth Olympic Park	1	1									1										1	
116	Smart Sustainable District	1	1	1	1		1	1	1		1		1			1	1	1			1	1	
117	Re:Code	1	1	1													1					1	
118	Refill London	1	1	1					1	1												1	
119	Resource London Programme Retrofit			1	1						1												
120	Accelerator - Homes Retrofit	1	1	1		1	1	1															
121	Accelerator - Workplaces	1	1				1	1	1		1											1	
122	Rogue Landlord Checker			1										1								1	
123	Santander Cycles	1	1										1									1	
124	Sharing Cities: E-Z Cycle	1	1	1	1		1	1				1											
125	Sharing Cities: Greenwich Energy Hero	1	1	1			1						1									1	
126	Sharing Cities: Street Lighting Smart Mobility	1	1	1	1		1	1				1							1			1	
127	Living Lab: London			1		1						1										1	
128	Solar Together London	1	1	1			1	1															
129	SportsAid			1	1																		1
130	Strand Aldwych project	1	1					1				1	1	1		1	1						
131	StreetWise	1	1	P	1							1							1			1	
132	Talk London			1	1															1		1	
133	Tech London	1	1																		1	1	

#	Initiatives	Organizations					Specific Domains																
		A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
134	Techinvest Programme		1																		1		1
135	TechPathways London	1	1	1	1												1				1		1
136	Thames Estuary Production Corridor / Creative Estuary	1	1			1										1					1		
137	Thames Tideway Tunnel	1	1						1	1													
138	The Big London Energy Switch	1	1	1			1								1								
139	The Lorry Safety Project	1			1							1							1				
140	Thermos	1	1	1	1		1															1	
141	Thrive LDN			1	1										1								
142	Tomorrow's Market	1	1																		1		
143	Ultra Low Emission Zones (ULEZ)		1				1	1				1		1									
144	Urban Albedo Project	1	1	1	1																		1
145	Warmer Homes	1	1				1						1		1								
146	Wayfindr Open Standard	1			1													1				1	
147	Well Communities			1	1																		1
148	West End Project	1	1	1			1				1	1		1									
149	Wild About Gardens				1							1											1
150	Workforce Integration Network (WIN)			1	1											1					1		
151	Wrap Up London	1	1	1												1							
152	Zero emission taxis		1				1	1				1											

Rio de Janeiro

Table A5

Rio de Janeiro's Initiatives

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1746		1																	1			
2	Academia Carioca		1								1			1									
3	Adote.Rio	1	1	1							1												
4	Armazenzinho		1													1	1					1	
5	Bike Itaú	1	1				1				1											1	
	Bilhete Único																						
6	Carioca / Rio Card +		1								1											1	
7	BRT TransBrasil	1	1								1												
8	Bus Rapid System -BRS		1									1											
9	Caravana da Ciência		1														1						
10	Carioca Digital		1																1			1	
11	Carnval Inclusivo			1											1	1		1					
12	Cartão Família Carioca		1												1		1						
13	Casa da Mulher Carioca		1												1		1				1		
	Centro de																						
14	Operações Rio (COR)		1								1								1			1	
	Centro Integrado																						
15	de Comando e Controle (CICC)		1																1			1	
	Centros																						
16	Municipais de Referência da		1															1					
	Pessoa com Deficiência																						
17	Data.Rio		1																	1		1	
	Desafio COR -																						
18	Smart city, smart people	1	1	1				1			1										1		
	Diagnóstico																						
19	Socioterritorial Participativo		1	1											1				1			1	
	Dicionário de Favelas				1	1									1	1	1						
	EcoParque do Caju e Unidade de																						
21	Biometanização	1	1		1		1			1													
22	Escola de Bamba		1	P											1	1	1						

		Organizations					Specific Domains																
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
23	Fazenda Urbana Via Parque	1															1						1
24	Forsoft Fórum de	1															1					1	
25	Desenvolvimento do Rio	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
26	Gestão Ambiental do Sistema da Lagoa Rodrigo de Freitas		1						1	1	1												1
27	Giro Identidade	1										1										1	
28	Carioca		1																1			1	
29	Jogos Estudantis do Rio de Janeiro	1	1	1																			1
30	labGov.RIO		1				1					1				1		1			1	1	
31	Mapa Cicloviário		1	1								1											
32	Mapa Solar do Rio de Janeiro		1		1		1															1	
33	Minha Casa Minha Vida		1										1		1								
34	Mutirão Reflorestamento		1	1				1	1		1												
35	Naves do Conhecimento		1												1		1				1	1	
36	Orquestra nas Escolas		1	P											1		1						
37	Participa Rio		1	1																1		1	
38	Partiu Praia		1						1											1		1	
39	Portal da Transparência		1																	1			
40	Porto Maravilha	1	1	1	1			1	1		1	1	1		1	1	1	1			1		
41	Praia para Todos Programa	1	1	1											1			1					
42	Aconchego Família			1										1	1		1						1
43	Programa Cuidar da Cidade		1																	1			
44	Programa de despoluição da Baía de Guanabara		1							1		1											
45	Programa de Saneamento da Barra da Tijuca, Recreio dos Bandeirantes e Jacarepaguá		1							1													
46	Programa Escolas Sustentáveis		1	P													1						
47	Programa Heróis do Tabuleiro		1	P											1		1						

		Organizations					Specific Domains																	
#	Initiatives	A	B	C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
48	Programa Hortas Cariocas		1	P											1	1		1				1		1
49	Programa Segurança Presente		1																1					
50	Programa Territórios Sociais		1			1										1		1						
51	Programa Zona Franca Social (ZFS)		1																		1			
52	Projeto Conexão Mata Atlântica		1		1	1	1		1	1		1												
53	Projeto Recicla Orla	1									1													
54	Projeto Ruas Public Lighting				1										1	1	1	1					1	
55	Renovation	1	1				1	1											1				1	
56	Restaurante Popular		1													1								1
57	Rodando com Tampinhas		1	1							1					1			1					
58	Saúde.rio		1												1					1			1	
59	Sensores de Alagamento	1	1							1										1			1	
60	Sistema Municipal de Informações Urbanas		1																				1	
61	Sistema Novo Guandu		1							1														

II. Annex B – Organizations

A: Industry; **B:** Government; **C:** Civil Society; **D:** Scientific Community; **E:** Other

Berlin

Table B1

Berlin's Organizations

#	Initiatives	Organization	A	B	C	D	E
1	1, 18, 20, 26, 66, 75, 109, 112, 150	Berliner Stadtreinigung (BSR)		1			
2	2, 3, 35, 36, 56, 57, 82, 83, 105, 114, 122	Fraunhofer Institute for Open Communication Systems (FOKUS)				1	
3	2, 114	Fraunhofer IZM				1	
4	3, 29, 41, 42, 43, 44, 47, 56, 66, 75, 93, 97, 99, 106, 109, 112, 128, 147, 149, 150	Berliner Verkehrsbetriebe (BVG)		1			
5	3, 34, 35, 66, 71, 75, 76, 93, 97, 99, 104, 106, 119, 147	Berliner Agentur für Elektromobilität (eMo)		1			
6	3, 122, 149, 150	DLR				1	
7	3, 48, 61, 105	Freie Universität Berlin				1	
8	3, 105	Hella Aglaia Mobile Vision GmbH	1				
9	3, 105	IAV GmbH	1				
10	3, 10, 34, 35, 37, 45, 50, 51, 66, 77, 85, 93, 97, 104, 106, 110, 127, 147	Technische Universität (TU Berlin)				1	
11	3, 92, 122	Berliner Betreibergesellschaft mbH / verkehr mobilität zukunft (VMZ)	1				
12	3, 14, 30, 34, 66, 99, 105, 111, 119, 141	Senatsverwaltung für Wirtschaft, Energie und Betriebe (SenWiEnBe)		1			
13	3, 29, 48, 49, 59, 76, 84, 92, 105, 109, 110, 144, 146, 145, 147, 149	Senatsverwaltung für Umwelt, Verkehr und Klimaschutz (SenUVK)		1			
14	3, 99	EasyMile	1				
15	3	Ioki	1				
16	3, 39, 66, 69, 75, 112, 150	Berliner Wasserbetriebe (BWB)		1			
17	4	Graforce Hydro GmbH	1				
18	5	ATOS	1				
19	6	BTB	1				
20	7, 21, 106	Humboldt Universität				1	
21	7, 66, 126	Senatsverwaltung für Stadtentwicklung und Wohnen (SenSW)		1			
22	7	University of Applied Sciences Neubrandenburg				1	
23	8, 10, 51, 61, 63, 112	Wista Management / Plan	1			1	
24	8	ICE Gateway GmbH	1				
25	9	Baugemeinschaft	1				

#	Initiatives	Organization	A	B	C	D	E
26	10, 51, 86	Hochschule für Technik und Wirtschaft (HTW Berlin)				1	
27	10, 51, 122, 137	SIEMENS AG	1				
28	11	MINT Engineering GmbH	1				
29	13, 119	LNC GmbH	1				
30	14	Deutsche Gesellschaft für Sonnenenergie (DGS)			1		
31	15, 121, 125	Deutsche Bahn - DB		1			
32	15, 86	The Things Industries	1				
33	16, 107	Tegel Projekt GmbH	1				
34	16, 107, 143	Land Berlin		1			
35	16, 107	Beuth University of Applied Sciences				1	
36	18	Repair Café Foundation			1		
37	21, 37, 119	Bundesministeriums für Bildung und Forschung (BMBF)		1			
38	21, 22, 23, 85, 109	Berliner Wasserbetriebe (BSB)		1			
39	21	Fraunhofer IAIS				1	
40	21	Fraunhofer IOSB				1	
41	21, 109	e.sigma Technology GmbH	1				
42	21	Dr.-Ing. Pecher e Partner		1			
43	21	Ingenieurgesellschaft mbH		1			
44	21	Kappa optronics GmbH		1			
45	21	Zentrum für Bild- und Signalverarbeitung e.V. (ZBS)				1	
46	22	JT - elektronik GmbH	1				
47	24	Berliner Institut für Gesundheitsforschung Max-Delbrück-Centrum für Molekulare Medizin in der Helmholtz-Gemeinschaft (MDC)				1	
48	24, 29	Charité – Universitätsmedizin Berlin				1	
49	25	Kulturstiftung Schloss Britz			1		
50	27	Chargomat	1				
51	28	Circular Economy House (CRCLR)			1		
52	29, 49	Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMUB)		1			
53	30, 86, 141	Technologiestiftung Berlin			1		
54	32	Betahaus	1				
55	33	IBUS Architekten und Ingenieure	1				
56	34, 93, 97, 106	BMW	1				
57	35, 46	Bundesministerium für Verkehr und digitale Infrastruktur (BMVI)		1			
58	35	Licht-Technik Vertriebs GmbH	1				
59	35, 51	Cisco Systems GmbH	1				
60	38	Door2Door	1				
61	39	atip:tap			1		
62	40	Dycle			1		
63	45	ANLEG GmbH	1				
64	45	Berliner Hafen und Logistik mbH		1			
65	45	BALLARD Power Systems Inc.	1				
66	45	EST-Floattech BV	1				
67	45	Imperial Logistics International B.V. & Co. KG	1				
68	45	Schiffswerft Hermann Barthel GmbH	1				

#	Initiatives	Organization	A	B	C	D	E
69	45	SER Schiffselektronik Rostock GmbH	1				
70	46, 133	Sozial Helden			1		
71	46	Ubirch GmbH	1				
72	47	Fraunhofer IAO				1	
73	47	Technische Universität Dresden (TU Dresden)				1	
74	48	informationssysteme GmbH	1				
75	48, 75, 150	Carano Software Solutions GmbH	1				
76	50, 51, 99, 113, 147	Bundesministerium für Wirtschaft und Energie (BMWi)		1			
77	53, 98	Climate-KIC	1	1			
78	54, 147	Ubitricity	1				
79	55, 66, 75, 147	GASAG Solution Plus	1				
80	58	FLEXCoop Consortium	1			1	
81	61	Max Planck Institute				1	
82	61, 85	KonradZuse-Zentrum für Informationstechnik Berlin (ZIB)		1		1	
83	61	Helmholtz-Zentrum Berlin für Materialien und Energie (HZB)				1	
84	61	Bundesanstalt für Materialforschung und -prüfung (BAM)				1	
85	62	GSW Gesellschaft für Siedlungs- und Wohnungsbau Baden-Württemberg mbH	1				
86	62	Berlin Partner für Wirtschaft und Technologie GmbH	1	1			
87	62	Daimler AG	1				
88	62	digitalSTROM	1				
89	62	Kessler Real Estate Solutions GmbH	1				
90	62	Panasonic	1				
91	62	Schindler	1				
92	63	LichtBlick	1				
93	63	Stadt und Land Wohnbauten GmbH		1			
94	64, 77	German Museum of Technology		1			
95	65	Olympiastadion Berlin GmbH	1				
96	66	Kreditanstalt für Wiederaufbau (KfW)		1			
97	66	Imperial College London				1	
98	66, 149	Technische Universität München - TU Munich				1	
99	66	RWTH Aachen University				1	
100	66	Netherlands Organisation for applied scientific research TNO				1	
101	66	Ökotec	1				
102	66, 75, 109	Stromnetz Berlin GmbH	1				
103	66	Universiteit Utrecht				1	
104	66	Fachhochschule Potsdam				1	
105	66, 84	Behala (Berliner Hafen- und Lagerhausgesellschaft mbH)	1				
106	66	Nolde & Partner	1				
107	66	Brose	1				
108	66	Craiss	1				
109	66	Eurice	1				
110	66	Sieker	1				
111	66	Vattenfall	1				

#	Initiatives	Organization	A	B	C	D	E
112	66	Nextbike	1				
113	66	Virtualcity Systems	1				
114	66	Naturwissenschaftlichen und kulturellen Bildungsverbund Moabit			1		
115	66	STERN Gesellschaft der behutsamen Stadterneuerung mbH		1			
116	67	GreenPack mobile energy solutions GmbH	1				
117	68	Futurium gGmbH			1		
118	70, 82, 83	Berliner Feuerwehr		1			
119	70	Rosenbauer Deutschland GmbH	1				
120	71	Volkswagen AG	1				
121	71	Jülich Forschungszentrum				1	
122	71	Linde	1				
123	72	ZELL gGmbH			1		
124	74	ZEBAU GmbH					1
125	74, 127	Bundesministeriums des Innern, für Bau und Heimat (BMI)		1			
126	75	Vattenfall Wärme Berlin	1				
127	76	Life			1		
128	77	Erco	1				
129	78	Über den Tellerrand			1		
130	79	HaCon	1				
131	79	Alcatel-Lucent Deutschland AG	1				
132	79, 147	Reiner Lemoine Institut gGmbH			1	1	
133	79	Schneider Electric Deutschland GmbH	1				
134	80	DIN	1		1		
135	81	Deutsche Wissenschaftliche Gesellschaft für Erdöl, Erdgas und Kohle e.V. (DGMK)			1		
136	81	CityClean	1				
137	81	Jacques Obers			1		
138	82, 83	CombiRisk GmbH	1				
139	82, 83	TURM solutions GmbH	1				
140	82, 83	Verband öffentlicher Versicherer		1			
141	84	DHL	1				
142	84	LNC LogisticNetwork Consultants GmbH	1				
143	84	DPD	1				
144	84	GLS	1				
145	84	Hermes	1				
146	84	UPS	1				
147	86	Hochschule für Wirtschaft und Recht Berlin (HWR)				1	
148	87, 94, 96	GESOBAU AG		1			
149	88	Real Future AG	1				
150	89	ECF Aquaponik-Farmsystems	1				
151	90	Verband Berlin-Brandenburgischer Wohnungsunternehmen e. V. (BBU)	1				
152	91	Senatskanzlei des Regierenden Bürgermeisters		1			
153	92	Gewobag		1			
154	92	Klimaschutzinstitut			1	1	
155	92	E.ON	1				
156	92	Wohnungsbaugesellschaft Berlin-Mitte (WBM)	1				
157	93, 106	Charlottenburg-Wilmersdorf District		1			

#	Initiatives	Organization	A	B	C	D	E
158	94	AOK-Nordost	1				
159	94	GKV-spitzenverband	1				
160	95	Fraunhofer-Gesellschaft				1	
161	96	Bundesministerium für Familie, Senioren, Frauen und Jugend	1				
162	96	Deutschen Verband für Wohnungswesen, Städtebau und Raumordnung			1		
163	98	Deutsche Unternehmensinitiative Energieeffizienz (DENEFF)	1				
164	98	Agile E-on	1				
165	98	Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA)		1			
166	99	Zentralverband des Deutschen Baugewerbes e. V.	1				
167	100	Taurecon	1				
168	101	Paper Planes e.V.			1		
169	102, 103	Berliner Energieagentur	1	1			
170	103	GeWoSüd			1		
171	104, 119	Fraunhofer Institut für Produktionsanlagen und Konstruktionstechnik (IPK)				1	
172	104	Meyer & Meyer Holding GmbH & Co. KG	1				
173	104	WEMAG AG		1			
174	105	BLIC GmbH	1				
175	105	Daimler Center for Automotive IT Innovations (DCAITI)				1	
176	105	Deutsche Telekom	1				
177	109	Technische Universität Kaiserslautern (TU Kaiserslautern)				1	
178	109	Smart City Solutions GmbH	1				
179	109	Urban Software Institute GmbH	1				
180	109	Infrest GmbH	1				
181	110	Einstein Center Digital Future (ECDF)	1	1		1	
182	111	Ebee Smart Technologies GmbH	1				
183	113	Connected Living e. V.			1		
184	114	Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut (HHI)				1	
185	115	BeFood ag	1				
186	116	AfB - Social & Green			1		
187	117	Himmelbeet gemeinnützige GmbH			1		
188	117	Zusammen Wachsen e.V.			1		
189	118	Sonnenrepublik	1				
190	119	Holzmarkt Quartier Versorgungsgesellschaft mbH		1			
191	119	Leibnitz-Institut für Regionalentwicklung und Strukturplanung Erkner (IRS)				1	
192	122	Deutsches Forschungszentrum Für Künstliche Intelligenz (DFKI)				1	
193	122	Caire Urbanistica	1				
194	122	CGI	1				
195	122	Fondazione Bruno Kessler (FBK)				1	
196	122	Aalto University				1	
197	123	Bis es mir vom Leibe fällt e. v.			1		
198	124	Alba Facility Solutions GmbH	1				

#	Initiatives	Organization	A	B	C	D	E
199	125	Velogista GmbH	1				
200	125, 139	Inno2grid GmbH	1				
201	128	Solaris Electric Buses	1				
202	128	Bombardier Transportation GmbH	1				
203	128	Vossloh-Kiepe GmbH	1				
204	129	Mifactori				1	
205	130	Bundesverband mittelständische Wirtschaft (BVMW)	1				
206	130	Alexander von Humboldt Institut für Internet und Gesellschaft (HIIG)					1
207	130	Hasso Platner Institut					1
208	130	Technische Hochschule Brandenburg					1
209	130	Universität Potsdam					1
210	131	Howoge	1				
211	134	LIDL	1				
212	135	Kaufland	1				
213	136	50Hertz Transmission	1				
214	138	Naturtrip				1	
215	139	IPGarten	1				
216	30, 141	Investitionsbank Berlin			1		
217	142	Original Unverpackt	1				
218	148, 151	Verkehrsverbund Berlin-Brandenburg (VBB)	1	1			
219	144, 146	ADFC Berlin e.V.				1	
220	148	Nextbike	1				
221	147	Hubject	1				
222	147	Berlin Partner for Business and Technology GmbH	1	1			
223	149	Esslingen University of Applied Sciences					1
224	149	Verband Deutscher Verkehrsunternehmen - VDV		1			

Copenhagen

Table B2

Copenhagen's Organizations

#	Initiatives	Organizations	A	B	C	D	E
1	41	Kuben Management	1				
2	41, 51	Niels Lützen Landskabsarkitekter ApS	1				
3	41	Labland	1				
4	41	EnviDan	1				
5	41	Urgent.Agency	1				
6	41, 43	Udlændinge- Integrations og Boligministeriet		1			
7	41, 43	Transport- og Boligministeriet		1			
8	60	Opland Landskabsarkitekter	1				
9	3, 20, 31, 33, 35, 37, 41, 42, 43, 44, 55, 59, 61, 72, 78, 89, 90, 95, 98, 99, 101	HOFOR		1			
10	1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 19, 20, 21, 22, 23, 26, 28, 31, 35, 37, 38, 41, 42, 43, 44, 45, 47, 48, 49, 50, 52, 53, 54, 55, 58, 59, 60, 61, 63, 67, 69, 71, 72, 73, 74, 76, 80, 81, 82, 83, 85, 88, 91, 92, 93, 94, 95, 96, 97	Københavns Kommune (KK)		1			
11	8, 59, 98	Frederiksberg Kommune (FK)		1			
12	61	Miljøpunkt Østerbro			1		
13	95	Malmos A/S	1				
14	95	GHB Landskabsarkitekter A/S	1				
15	95, 42	Orbicon A/S	1				
16	95	VIA Trafik Rådgivning A/S	1				
17	95	Feld Studio for Digital Crafts	1				
18	42	Arkitema Architects	1				
19	42	Habitat	1				
20	47	Gaardrum	1				
21	47	BSAA Urbanlab	1				
22	47	Holmsgaard Ingeniører	1				
23	47	Operate	1				
24	42, 44, 80	SLA Landskabsarkitekter	1				
25	4, 44, 59, 80, 98	Niras	1				
26	43	Bogl	1				
27	43, 77	Lendager Group	1				
28	43	SlothMøller	1				
29	63	Skou Gruppen A/S	1				
30	63	KANT Architects	1				
31	63	EFFEKT Architects	1				
32	62	Henning Larsen Architects	1				
33	62	Logick & Co	1				
34	62	Saint-Gobain	1				
35	33, 62	Grundejernes Investeringsfond			1		
36	62	Byggeskadebogen vedrørende Bygningsfornyelse (BVB)			1		

#	Initiatives	Organizations	A	B	C	D	E
37	9	A4 Arkitekter	1				
38	9	Bygningsfornyelse og Københavns Kommune		1			
39	37, 81	Tredje Natur - Third Nature	1				
40	81	Grøn Tåsingegade			1		
41	5, 28, 35, 67, 72, 90	COWI	1				
42	72	NCC/SMET	1				
43	51	Association of Bryggervangen residents			1		
44	73	MLPR Architects	1				
45	1	Fonden Østergården			1		
46	94	ØsterGRO			1		
47	15, 21, 25, 35, 36, 58, 64, 68, 77, 86, 87, 90, 101	Danmarks Tekniske Universitet - DTU				1	
48	101	Innovationsfonden			1		
49	101	DHI Group	1				
50	101	Krüger	1				
51	46, 66, 77, 101	Ramboll Group	1				
52	101	DMI		1			
53	101	Forsikring og Pension	1				
54	101	Kompetenzzentrum Wasser Berlin				1	
55	101	Berlin Wasserbetriebe		1			
56	101	Aarhus Vand		1			
57	101	VandCenter Syd		1			
58	101	BIOFOS		1			
59	30, 33, 35, 39	By & Havn		1			
60	35	Radius Elnet	1	1			
61	35	ABB	1				
62	35, 89	Danfoss	1				
63	35	Nerve Smart Systems	1				
64	35	Glen Dimplex Nordic	1				
65	35	Metro Therm A/S	1				
66	35	PowerLabDK		1		1	
67	90	Teknologisk Institut				1	
68	90	CTR		1			
69	90	VEKS		1			
70	90	Innoterm S/A	1				
71	90	Dansk Miljø- & Energistyring A / S - DME	1				
72	90	Alfa Laval	1				
73	89	Kamstrup	1				
74	89	Grundfos	1				
75	33	Teknik- og Miljøforvaltningen		1			
76	33	Københavns Ejendomme & Indkøb		1			
77	33	Aberdeen Asset Manager a/s	1				
78	33	Admiral Hotel	1				
79	33	Andelsboligforeningernes Fællesrepræsentation - ABF			1		
80	33	AP Pension			1		
81	33	Arbejdernes Landsbank	1				
82	33	Arup og Hvidt	1				
83	33	ATP Ejendomme	1				
84	33	BC Hospitality Group	1				
85	33	Bygherreforeningen			1		

#	Initiatives	Organizations	A	B	C	D	E
86	33	Bygningsstyrelsen		1			
87	33	Castellum	1				
88	33	CBRE	1				
89	33	City Ejendomsforvaltning ApS	1				
90	33	Colliers International	1				
91	33	Corpus Development	1				
92	33	CPH Containers	1				
93	33	Danica Pension			1		
94	33	Dansk Byggeri	1				
95	33	DEAS	1				
96	33	EjendomDanmark	1				
97	33	Guldsmeden Hotels	1				
98	33	Hotel d'Angleterre	1				
99	33	Karberghus A/S	1				
100	33	Kirkbi	1				
101	33	KLP Ejendomme	1				
102	33	Lejernes LO i Hovedstaden			1		
103	33	Newsec	1				
104	33	P+ Pension	1				
105	33	Pension Danmark	1				
106	33	PKA Ejendomme	1				
107	33	Refshaleøens Ejendomsselskab	1				
108	33	Slots- og Kulturstyrelsen		1			
109	33	Steen og Strøm Danmark A/S	1				
110	33	UBSBolig	1				
111	33	Vest Administration A/S	1				
112	33	Wonderful Copenhagen			1		
113	8, 27, 46	DSB		1			
114	5, 28, 67	Technolution	1				
115	5, 28, 67	Hermes Traffic Intelligence	1				
116	5, 28, 67	Jesper K Thomsen	1				
117	5, 28, 67	InfraTeam	1				
118	5, 28, 67	ITS Teknik	1				
119	24, 100	Cyklistforbundet			1		
120	100	Gubra	1				
121	16, 27, 39, 70	Metroselskabet			1		
122	39	Holo	1				
123	27, 29, 39, 45, 66, 68, 70	Movia		1			
124	39	Homeowners' association			1		
125	57	Århusgadekvarteret					
126	14, 24, 25, 26, 34, 64, 68, 77, 92	Hovedstaden Letbane		1			
127	15, 21	Region Hovedstaden		1			
128	15	Copenhagen Business School				1	
129	75	Transportens Innovationsnetværk (TINV)	1	1		1	
130	75	Human Habitat	1				
131	75	Miljøpunkt Nørrebro			1		
132	34, 75	Københavns Professionshøjskole				1	
133	6	RealDania foundation			1		
134	10	Blaffernation			1		
135	65	Byhøst			1		
136	96	Havhøst			1		
		Banedanmark			1		

#	Initiatives	Organizations	A	B	C	D	E
137	96	Tranberg Architects	1				
138	13, 17	Clever	1				
139	26	Drive Now	1				
140	26	Green Mobility	1				
141	8	Bikeshare Danmark A / S	1				
142	8	By- og Pendlercykel Fonden					1
143	8	City Bicycle IT	1				
144	15	City Logistics	1				
145	21	Leapcrafts	1				
146	21	Silver Spring Networks	1				
147	21, 64, 91	CISCO	1				
148	21, 64, 91	Citelum	1				
149	21, 91	TDC Group A / S	1				
150	97	Maker			1		
151	97	Beta Lab			1		
152	86	Københavns Universitet				1	
153	86	Lund University				1	
154	86	Høje Taastrup Kommune		1			
155	64, 86	Lund kommun (SWE)		1			
156	64, 86	Malmö kommun (SWE)		1			
157	77, 86	Eon	1				
158	86	Båstad kommun (SWE)		1			
159	86	Malmö University				1	
160	64, 86	Lund University				1	
161	64, 86	Krafttringen Energi		1			
162	86	Høje-Taastrup Fjernvarme		1			
163	84	Forum Virium Helsinki		1			
164	84	Digipolis	1				
165	84	Stad Antwerpen		1			
166	84	21C Consultancy Limited	1				
167	84	Imec				1	
168	14	CLEAN	1				
169	14	Hitachi Solutions	1				
170	76	Utrecht Universiteit				1	
171	76, 87	Aarhus Universitet				1	
172	76	Google	1				
173	64, 77	Region Skåne		1			
174	25, 64	Albertslund Kommune		1			
175	64	Roskilde Kommune		1			
176	64	Kalundborg Kommune		1			
177	64	Helsingborg kommun (SWE)		1			
178	64, 77, 87	Aalborg Universitet				1	
179	64	Invest in Skåne		1			
180	64	Innovation Skåne		1			
181	24, 25, 58, 64, 68, 77, 78, 79, 83, 87	Gate 21	1	1		1	
182	64	Copenhagen Capacity		1			
183	64	Ørsted A/S (former DONG Energy)		1			
184	64	Zumtobel	1				
185	64	Signify (former Phillips Lighting)	1				
186	64	Ballerup Kommune		1			
187	64	Bjuv Kommun (SWE)		1			
188	64	Egedal Kommune		1			
189	64	Faxe Kommune		1			

#	Initiatives	Organizations	A	B	C	D	E
190	64	Gladsaxe Kommune		1			
191	64	Klippan Kummun (SWE)		1			
192	64	Kristianstad Kommun (SWE)		1			
193	64, 78	Lolland Kommune		1			
194	64	Trelleborg Kommun (SWE)		1			
195	34	Energistyrelsen		1			
196	34	Energi Forum Danmark			1		
197	34	KL		1			
198	25, 77	Region Sjælland		1			
199	77	Sustainable Business Hub Scandinavia	1	1		1	
200	77	SEAS-NVE	1				
201	77	Refa Energi		1			
202	77	GeoDrilling	1				
203	77	Neogrid	1				
204	77	Schneider Electric Danmark	1				
205	77	AffaldPlus I/S		1			
206	77	BOFA		1			
207	87	Force Tecnology	1				
208	87	Dansk Center for Lys (DCL)			1		
209	25, 87	Uddannelses- og Forskningsministeriet		1			
210	83	Oslo kommune (NOR)		1			
211	83	Stockholm kommun (SWE)		1			
212	72	Sweco	1				
213	59, 98	Frederiksberg Forsyning A/S		1			
214	93	Amager Resource Center (ARC)		1			
215	12	Park Architects	1				

Lisbon

Table B3

Lisbon's Organizations

#	Initiatives	Organizations	A	B	C	D	E
1	1, 2, 3, 5, 8, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 29, 30, 31, 32, 33, 34, 35, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60, 61, 62, 63, 65, 64, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 82, 84, 86, 87, 88, 89, 90, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 104, 105, 106, 107, 108	Câmara Municipal de Lisboa (CML)		1			
2	14, 74, 107	NEC Corporation	1				
3	48	InteGRIDy Consortium	1	1		1	
4	101, 105	ANA - Aeroportos de Portugal	1				
5	4, 7, 11, 82, 87, 94, 101, 105	Companhia Carris de Ferro de Lisboa		1			
6	66, 105	Câmara Municipal de Almada		1			
7	105	Câmara Municipal do Barreiro		1			
8	105	Fertagus	1				
9	82, 87, 105	Metropolitano de Lisboa		1			
10	105	Metro Transportes do Sul (MTS)	1				
11	66, 105	Rodoviária de Lisboa	1				
12	105	Scotturb	1				
13	105	Transportes Sul do Tejo (TST)	1				
14	105	Transtejo & Soflusa	1				
15	105	Vimeca	1				
16	40	Associação Turismo de Lisboa			1		
17	40	Turismo Portugal		1			
18	40	Instituto Nacional de Estatística (INE)		1		1	
19	40, 96, 97, 98, 99	EDP Distribuição	1				
20	40	Instituto Português do Mar e da Atmosfera (IPMA)		1		1	
21	40	Instituto Hidrográfico		1		1	
22	6, 18, 45, 54	Universidade de Lisboa (Ulisboa)				1	
23	12, 49, 54, 88, 96, 97, 98, 103, 107	Universidade Nova de Lisboa				1	
24	37, 45, 54, 96, 97, 98	Instituto Superior Técnico (IST) / Técnico de Lisboa				1	
25	45, 54	Instituto Universitário de Lisboa (ISCTE)				1	
26	45, 54	Instituto Superior de Engenharia de Lisboa (ISEL)				1	
27	45, 54	Laboratório Nacional de Engenharia Civil (LNEC)				1	

#	Initiatives	Organizations	A	B	C	D	E
28	54	Universidade Católica Portuguesa				1	
29	54	Universidade do Minho				1	
30	12, 64, 67, 96, 97, 99, 102, 103	Agência de Energia e Ambiente de Lisboa (Lisboa E-Nova)			1		
31	102	Município, S.A.	1				
32	107	Agência para a Modernização Administrativa (AMA)	1				
33	107	Centro Nacional de Supercomputación (CNS)				1	
34	49	New Energy and Industrial Technology Development Organization (NEDO)		1		1	
35	49	Laboratório Nacional de Energia e Geologia (LNEG)				1	
36	49	Everis	1				
37	49	EDP	1				
38	49	Daikin Industries	1				
39	49	Efacec Energia	1				
40	92	Compta	1				
41	96, 98, 99	Centre of Engineering and Product Development (CEiiA)				1	
42	21, 27, 67, 72, 82, 91, 96, 98, 99	Empresa Municipal de Mobilidade e Estacionamento de Lisboa (EMEL)		1			
43	96	Centre for New Energy Technologies (CNET) / NEW				1	
44	60	LRB - Investimentos e Consultoria	1				
45	45	Lispolis	1				
46	45	Institute for Systems and Robotics (ISR)				1	
47	45	Sociedade Portuguesa de Robótica (SPR)				1	
48	45	Idmind	1				
49	45	Tekever	1				
50	45	Centro de Formação Profissional da Indústria Electrónica, Energia, Telecomunicações e Tecnologias da Informação (CINEL)			1		
51	45	Instituto de Educação Técnica (INETE)				1	
52	21, 45	GMV	1				
53	45	ABB	1				
54	45	Morais Leitão, Galvão Teles, Soares da Silva e Associados	1				
55	45	UAVision Aeronautics	1				
56	45	Instituto Superior de Educação e Ciências (ISEC)				1	

#	Initiatives	Organizations	A	B	C	D	E
57	45	Turf Lynx	1				
58	45	Robo Savvy	1				
59	45	Albatroz Engineering	1				
60	45	Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento (INESC-ID)				1	
61	45, 66	Fundação Calouste Gulbenkian			1		
62	45	Thales	1				
63	45	Spin.Works	1				
64	45	Indra	1				
65	45	Bridge Robotics	1				
66	21, 45, 101	Siemens	1				
67	45	Omnidea	1				
68	45	Introsys	1				
69	45	EPL	1				
70	45	Connect Robotics	1				
71	45	Artica	1				
72	26	Amorim Cork Composites	1				
73	26	Ydreams	1				
74	26	Escola Técnica de Imagem e Comunicação (ETIC)				1	
75	26	Iberomoldes Group	1				
76	26	Centro Tecnológico da Indústria de Moldes, Ferramentas Especiais e Plásticos (CENTIMFE)					1
77	8, 28, 101, 110, 111	Empresa Portuguesa das Águas Livres (EPAL)		1			
78	59, 81, 101	GALP	1				
79	101	Sonae Sierra	1				
80	66, 88, 101	Santander	1				
81	5	Gebalis		1			
82	101	Mota-Engil	1				
83	101	Comboios Portugal (CP)		1			
84	101	Brisa	1				
85	101	Tb.lx	1				
86	82, 101	Beta-i	1				
87	101	Cisco	1				
88	101	NOS	1				
89	22, 38, 57, 66, 80, 101, 104	Santa Casa da Misericórdia de Lisboa (SCML)				1	
90	101	Tomi World	1				
91	101	Axians	1				
92	53	Microsoft	1				
93	53, 104	Regimento de Sapadores de Bombeiros de Lisboa (RSB)		1			
94	53	SAP	1				
95	53	Altice	1				
96	6	Pontifícia Universidade Católica de São Paulo				1	

#	Initiatives	Organizations	A	B	C	D	E
97	6	Geometral	1				
98	21	Via Verde	1				
99	80	Instituto da Segurança Social		1			
100	38, 80	Administração Regional de Saúde de Lisboa e Vale do Tejo (ARSLVT)		1			
101	80, 104	Polícia de Segurança Pública (PSP)		1			
102	10, 80	Rede Social de Lisboa	1	1	1		
103	32, 93	Banco Montepio	1				
104	32	Instituto de Apoio às Pequenas e Médias Empresas e à Inovação		1			
105	56	Meep	1				
106	82, 93	Deloitte	1				
107	82	Armis	1				
108	93, 109	Operadores de Transporte de Lisboa (OTLIS)	1	1			
109	69	Hive	1				
110	69	Jump	1				
111	69	Lime	1				
112	87	Samsung	1				
113	96	Reabilita	1				
114	99	Altice Labs	1				
115	69	eCooltra	1				
116	37	Universidade de Aveiro (UA)					1
117	37	Technical University of Crete					1
118	37	Demokritos National Centre for Scientific Research					1
119	37	Finnish Institute for Health and Welfare (THL)		1			1
120	69	DriveNow	1				
121	69	Emov	1				
122	69	Hertz 24/7 City	1				
123	69	Bird	1				
124	69	Frog	1				
125	69	Circ	1				
126	69	Voi	1				
127	69	Tier	1				
128	8	Grupo de Estudos de Ordenamento do Território e Ambiente (GEOTA)				1	
129	83	Fashion Revolution Portugal			1		
130	83, 85	Circular Economy Portugal			1		
131	10	Rede Desenvolvimento Local de Base Comunitária de Lisboa (DLBC)	1	1	1		
132	18	Administração do Porto de Lisboa (APL)		1			
133	18	Associação Naval de Lisboa			1		
134	18	Clube Ferroviário de Portugal			1		
135	18	Náutico Clube Boa Esperança (NCBE)			1		

#	Initiatives	Organizations	A	B	C	D	E
136	18	Sport Algés e Dafundo			1		
137	38	Direção Geral de Saúde		1			
138	43	Associação de Empresas de Ginásios e Academias de Portugal (AGAP)	1				
139	43	Be Gym	1				
140	43	Balance Club	1				
141	43	Clube VII	1				
142	43, 61	Ginásio Clube Português			1		
143	43, 61	Go Fit	1				
144	43	Holmes Place	1				
145	43	Jazzy	1				
146	43	Supera	1				
147	61	Associação de Paralisia Cerebral de Lisboa (APCL)			1		
148	61	Lisboa Ginásio Clube			1		
149	61	CERCI Lisboa			1		
150	34, 78	Associação Bandeira Azul da Europa (ABAE)			1		
151	39, 79	Valorização e Tratamento de Resíduos Sólidos das Regiões de Lisboa e do Oeste (Valorsul)	1				
152	88	Associação de Estudantes da NOVA Medical School (AEFCM)			1		
153	88	Instituto Português de Desporto e Juventude (IPDJ)		1			
154	88	José de Mello Saúde (CUF)	1				
155	58	Companhia Musical Teatral					1
156	93	Associação Serve the City Portugal (STC)			1		
157	93	Plataforma de Apoio aos Refugiados (PAR)			1		
158	93	Associação SOL			1		
159	93	Exército de Salvação			1		
160	93	Comunidade Vida e Paz			1		
161	93	Fundação Bonfim			1		
162	103	Climate-KIC	1	1			
163	25, 29, 64, 68, 71	Sociedade de Reabilitação Urbana Lisboa Ocidental (SRU)		1			
164	66	Escola de Música do Conservatório Nacional (EAMCN)		1			
165	66	Associação Orquestras Sinfónicas Juvenis Sistema Portugal (AOSJSP)			1		
166	66	Associação de Amigos da Escola de Música do Conservatório Nacional (AAEMCN)			1		
167	66	Município da Amadora		1			

#	Initiatives	Organizations	A	B	C	D	E
168	66	Município de Loures	1				
169	66	Município de Oeiras	1				
170	66	Município de Sesimbra	1				
171	66	Ministério da Educação	1				
172	66	Ministério da Administração Interna	1				
173	66	Fundação Share			1		
174	66	Conservatório de Música de Coimbra		1			
175	66	BNP Paribas	1				
176	66	Associação D. Pedro V			1		
177	66	TAP Portugal	1				
178	66	Caixa Geral de Depósitos		1			
179	66	Antena 2		1			
180	66	Área Metropolitana de Lisboa (AML)		1			
181	59	Bluecharge	1				
182	59	Digital Charging Solutions	1				
183	59	Charge2go	1				
184	59	EDP Comercial	1				
185	59	Prio.E	1				
186	59	GRCApp /Evaz	1				
187	59	Mobi.E		1			
188	68	Atelier NPK	1				
189	75	Associação Bairros			1		
190	75	Associação Renovar a Mouraria			1		
191	57	Fundação Ricardo Espírito Santo Silva			1		
192	51	Faculdade de Belas Artes				1	
193	2	SBI Consulting	1				
194	2	União de Associações do Comércio e Serviços (UACS)	1				
195	9, 16, 95	Associação para a Mobilidade Urbana em Bicicleta (MUBI)			1		
196	89	Schröder	1				
197	89	Agência para o Investimento e Comércio Externo de Portugal (AICEP)		1			
198	33	Lusoponte	1				
199	33	Signify	1				
200	96, 97, 98, 99	Sharing Cities Consortium	1	1	1	1	

London

Table B4

London's Organizations

#	Initiatives	Organizations	A	B	C	D	E
1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 29, 30, 31, 33, 34, 35, 38, 40, 41, 43, 44, 45, 46, 48, 49, 50, 51, 52, 54, 59, 60, 61, 62, 65, 63, 66, 67, 68, 71, 72, 73, 75, 77, 79, 80, 81, 82, 83, 84, 85, 86, 88, 89, 90, 91, 92, 93, 95, 96, 97, 98, 100, 101, 102, 103, 105, 106, 107, 109, 110, 112, 113, 114, 116, 117, 118, 119, 120, 121, 122, 124, 126, 128, 129, 132, 133, 134, 135, 136, 140, 141, 142, 143, 145, 147, 148, 150, 152	Greater London Authority (GLA) / Mayor of London		1			
2	135	Tech Talent Charter				1	
3	7, 18, 19, 24, 25, 26, 28, 30, 31, 33, 34, 46, 50, 62, 63, 64, 69, 73, 94, 100, 102, 103, 109, 123, 126, 143, 148, 151, 152	Transpor for London (TfL)			1		
4	12, 26	London Fire Brigade			1		
5	20, 26, 29	London Legacy Development Corporation (LLDC) / Queen Elizabeth Olympic Park			1		
6	26, 85	Mayor's Office for Policing And Crime (MOPAC)			1		
7	26	London Connected Learning Center (CLC)				1	
8	135	Education Development Trust			1		
9	135	Queen Mary University of London				1	
10	26	One Tech			1		
11	26	JP Morgan Chase Foundation			1		
12	20, 41, 43	A New Direction			1		
13	20, 41	Mayor's Fund for London			1		
14	20, 41	European Social Fund (ESF)			1		
15	20, 41	Department for Work and Pensions (DWP)				1	
16	20, 41	T I Media		1			
17	20, 41, 101	Borough of Waltham Forest Council			1		
18	43	Hustle-Crew		1			
19	43	People of Color in Tech (POCiT)		1			
20	20, 41, 43, 146	Ustwo		1			
21	43	Depop		1			
22	43	AirBnB		1			
23	41	Bio Agency		1			
24	20, 41	Sennep		1			
25	20, 41	Made by Many		1			

#	Initiatives	Organizations	A	B	C	D	E
26	41	The Skills Lab	1				
27	41	Pixeled Eggs	1				
28	20, 41	Reading Room	1				
29	20, 41, 43	Design and Art Direction (D&AD)			1		
30	20, 41	General Assembly	1				
31	20, 41	George P. Johnson	1				
32	20, 41	Screen Skills	1				
33	20, 29, 41	Victoria and Albert Museum (V&A)		1			
34	20, 41, 101	University of the Arts London (UAL)				1	
35	20, 41	Jobcentre Plus		1			
36	20, 41	Barbican Centre		1			
37	20, 41	Somethin Else	1				
38	20, 41, 101, 136	Arts Council England		1			
39	20, 41	New Musical Express	1				
40	20, 41	Creative & Cultural Skills			1		
41	20, 41	Punchdrunk			1		
42	20, 41	William Morris Gallery		1			
43	20, 41	Magnum Photos	1				
44	20, 41	Anyways	1				
45	20, 41	BuzzRamp	1				
46	20, 41	NTS Radio	1				
47	20, 41	Here East	1				
48	20, 29, 41	Sadler's Wells Theatre	1				
49	20, 41	Blackhorse Workshop	1				
50	20, 41	Rosetta Arts Center			1		
51	20, 41	Bow Arts			1		
52	20, 41	Whitechapel Gallery			1		
53	50, 87, 142	HM Government / Her Majesty's Government		1			
54	79, 87, 102, 142	London Economic Action Partnership (LEAP)		1			
55	106, 150	Black Training and Enterprise Group (BTEG)			1		
56	86, 106, 150	Trust for London			1		
57	42, 106, 150	City Bridge Trust			1		
58	79	Funding London	1				
59	79	Capital Enterprise	1				
60	79	Firestrtr	1				
61	79	Forward Partners	1				
62	79	Crowdcube	1				
63	79	Seedcamp	1				
64	79	Newable	1				
65	79	Playfair Capital	1				
66	79	Beacon Capital	1				
67	79	Downing	1				
68	79	Craigie Capital	1				
69	79	Albion Capital	1				
70	79	Startup Funding Club	1				
71	79	Venture Founders	1				
72	79	Mustard Seed	1				
73	79	Concentric	1				
74	102	Microsoft	1				
75	102	Social Tech Trust			1		

#	Initiatives	Organizations	A	B	C	D	E
76	85, 102	The Metropolitan Police		1			
77	133	Gust	1				
78	133	Tech Connect	1				
79	22, 108	Westway Trust			1		
80	22, 75	Borough of Barnet Council	1				
81	18, 22, 39	Borough of Enfield Council	1				
82	22	Borough of Tower Hamlets Council	1				
83	16, 22	Borough of Hammersmith & Fulham Council	1				
84	64, 75, 103, 111, 148	Borough of Camden Council	1				
85	75	Borough of Redbridge Council	1				
86	75	Borough of Sutton Council	1				
87	12, 15	London Office for Technology & Innovation (LOTI)	1				
88	83	Centre for Urban Science and Progress (CUSP)				1	
89	3	The Alan Turing Institute				1	
90	91, 136	Department for Digital, Culture, Media & Sport (DCMS)		1			
91	91	Deloitte	1				
92	91, 94	Plexal	1				
93	91	Centre for Secure Information Technologies				1	
94	91	Lloyd's Banking Group	1				
95	91	Kudelski Security	1				
96	91	Global Cyber Alliance			1		
97	91	Kx	1				
98	91	Dell	1				
99	94	Cadent Gas	1				
100	40, 94	UK Power Networks	1				
101	94	Virgin Media	1				
102	94	SGN	1				
103	15, 60, 84, 94, 99, 110, 126, 138, 141	London Councils		1			
104	19, 94	Openreach	1				
105	18, 94, 118, 137	Thames Water Utilities Ltd	1				
106	49, 82	Open Data Institute (ODI)			1		
107	15	Bloomberg Associates			1		
108	15	Eden Smith Group	1				
109	6	Air Monitors	1				
110	6, 78	C40 Cities		1			
111	4, 6	Cambridge Environmental Research Consultants (CERC)	1			1	
112	6	Environmental Defense Fund Europe (EDF)			1		
113	6	Google Earth Outreach	1				
114	6	National Physical Laboratory (NPL)				1	
115	6, 16, 63	King's College London				1	
116	6	University of Cambridge				1	
117	93	Valuation Office Agency (VOA)		1			
118	19	Vodafone	1				
119	19	Telefonica O2	1				
120	19	EE	1				
121	19	3UK	1				

#	Initiatives	Organizations	A	B	C	D	E
122	50	Jisk			1		
123	126	London Environment Directors' Network (LEDNet)		1			
124	126	European Investment Bank (EIB)		1			
125	126	London Lighting Engineers Group (LoLEG)		1			
126	46	Mayor's Design Advocates	1	1	1	1	
127	46	Architects for Change			1		
128	46	Centre for London			1		
129	46	Future of London			1		
130	46	Urban Design London			1		
131	27, 48, 63, 110, 141	National Health System Trust (NHS)		1			
132	27, 110	MedCity	1	1	1	1	
133	27	UCLPartners	1	1	1	1	
134	27	Imperial College Health Partners	1	1	1	1	
135	27	Health Innovation Network	1	1	1	1	
136	49	London & Partners	1	1			
137	134	UK Business Angels Association (UKBAA)	1				
138	117	Lego Group	1				
139	117	Institute of Imagination			1		
140	117	Raising Robots	1				
141	40	Energy Unlocked			1		
142	65	Element Energy	1				
143	65	Moixa	1				
144	13, 34, 65, 71, 108	Repowering Department for Business, Energy & Industrial Strategy (BEIS)		1			
145	65	Happy Energy Solutions Ltd	1				
146	145	Celsius	1	1		1	
147	7	Cullinan Studio	1				
148	7	Ramboll	1				
149	7	Colloide Engineering	1				
150	7	Gleeds	1				
151	7	GEA	1				
152	7	Topic Plan	1				
153	7	AECOM	1				
154	7	London South Bank University				1	
155	7	Toby Paterson	1				
156	7	Inner Circle Consulting	1				
157	7	McGurk Architects	1				
158	7	Aalborg University (AAU)				1	
159	140	ICLEI – Local Governments for Sustainability		1			
160	140	Deutsche Energie-Agentur (DENA)		1			
161	140	Creara	1				
162	140	Latvian Environmental Investment Fund			1		
163	140	Polish National Energy Conservation Agency (KAPE)		1			
164	140	Centre for Sustainable Energy (CSE)			1		
165	140	Imperial College of London				1	
166	18, 28, 30, 37, 116, 140						

#	Initiatives	Organizations	A	B	C	D	E
167	120	European Regional Development Fund					1
168	120	Turner & Townsend	1				
169	120	Energiesprong UK	1				
170	11, 120	Carbon Trust			1		
171	120	PA Consulting	1				
172	4, 7, 63, 140	Borough of Islington Council		1			
173	92	Octopus Energy	1				
174	121	Ameresco Limited	1				
175	121	Asset +	1				
176	121	Bouygues E&S FM UK Ltd	1				
177	121	Breathe Energy	1				
178	121	Cenergist	1				
179	121	Centrica	1				
180	121	E.on Control Solutions Ltd	1				
181	121	EDF Energy Customers plc	1				
182	34, 116, 121	Engie	1				
183	121	Mi-Space	1				
184	121	SPIE	1				
185	121	Statkraft	1				
186	121	SSE Contracting Limited	1				
187	121	Switch2Energy	1				
188	37, 121	Veolia	1				
189	121	Vital Energi Utilities Ltd	1				
190	80	Community Energy London (CEL)			1		
191	128, 138	iChoosr Limited	1				
192	4, 18, 63, 137	Department for Environment, Food & Rural Affairs (DEFRA)		1			
193	4	Copernicus Atmosphere Monitoring Service (CAMS)		1		1	
194	33	Centrica Consortium	1				
195	33	Bluepoint London	1				
196	33	Chargemaster	1				
197	33	Electricity Supply Board (ESB)		1			
198	33	Fastned	1				
199	29, 101	London College of Fashion				1	
200	101	National Lottery Heritage Fund			1		
201	42	The Dulverton Trust			1		
202	42	Garfield Weston Foundation			1		
203	42	The Henry Smith Charity			1		
204	42	The Leathersellers' Company Charitable Fund			1		
205	42	Fishmongers' Company's Charitable Trust			1		
206	42	ADM Fund			1		
207	42, 47, 74, 107, 147	The National Lottery Community Fund / Big Lottery			1		
208	42	Just Eat	1				
209	42	Hotpoint	1				
210	42	Octopus Group	1				
211	42	Cook	1				
212	42	Macquarie	1				
213	42	Whole Foods	1				

#	Initiatives	Organizations	A	B	C	D	E
214	42	Engine	1				
215	42	Talk.Global	1				
216	42	Booker Wholesale	1				
217	42	LIDL	1				
218	42	M&S	1				
219	42	Morrisons	1				
220	42	Riverford Organic Farmers	1				
221	42	Sainsbury's	1				
222	42, 74, 78	Tesco	1				
223	42	Waitrose	1				
224	42	City Harvest				1	
225	42	The Felix Project				1	
226	42	Aldi	1				
227	42	Asda	1				
228	34, 42	Coop	1				
229	42	MindfulChef	1				
230	47	Nesta's Health Lab				1	
231	47	New Balance	1				
232	47	BT PLC	1				
233	55	Growing Communities				1	
234	56	GrowUp Urban Farms Ltd	1				
235	70	Love Kingston				1	
236	70	Kingston Pound				1	
237	148	London First	1				
238	78, 148	Derwent London	1				
239	16, 148	Fitzrovia Partnership	1				
240	148	Eurovia	1				
241	148	Bee Midtown				1	
242	16, 37, 76, 148	City of Westminster Council		1			
243	76, 148	LDA Design	1				
244	148	Norman Rourke Pryme (NRP)	1				
245	148	VolkerHighways	1				
246	148	Crossrail		1			
247	139	London Cycling Campaign				1	
248	139	McGee	1				
249	139	Mobileye	1				
250	123	Serco	1				
251	123	Santander	1				
252	74	Living Under One Sun				1	
253	74	Homes for Haringey		1			
254	39, 74	Borough of Haringey Council		1			
255	74	Newlon Housing Trust				1	
256	74	Newlon Fusion				1	
257	74	Lee Valley Estates	1				
258	74	Church of England				1	
259	74	The Engine Room				1	
260	74	The Conservation Trust (TCV)				1	
261	39, 74	OrganicLea	1			1	
262	47, 74	Good Gym				1	
263	74	Haringey Friends of Parks Forum				1	
264	74	Haringey Association for Independent Living (HAIL)				1	

#	Initiatives	Organizations	A	B	C	D	E
265	74	Northumberland Park Residents Association			1		
266	74	Haringey Federation of Residents Associations			1		
267	74	LaSalle Investment Management	1				
268	59, 74	Team London			1		
269	74	Sustainable Haringey			1		
270	74	Chelsea Fringe CIC			1		
271	74	Film London			1		
272	29, 63, 74	University College London (UCL)				1	
273	74	Durham University				1	
274	74	The People's Health Trust			1		
275	74	Plunkett Foundation			1		
276	74	Community First			1		
277	147	Well Communities			1		
278	39	Esmée Fairbairn Foundation			1		
279	71	Borough of Lambeth Council		1			
280	16, 108	Royal Borough of Kensington and Chelsea Council		1			
281	13, 14	City of London Corporation		1			
282	34	Bank of America Merrill Lynch (BofA Securities)	1				
283	34	Metro Bank	1				
284	34	Network Rail		1			
285	34	Futerra	1				
286	34	Bates Wells & Braithwaite	1				
287	34	Coop Foundation				1	
288	34	Ethex	1				
289	146	Royal Society for Blind Children (RSBC)				1	
290	151	Hands On London				1	
291	151	William Blair	1				
292	151	Safestore	1				
293	151	Broadgate Estates	1				
294	151	British Land	1				
295	151	K2 Space	1				
296	151	Collect+	1				
297	151	Yodel	1				
298	151	UPS	1				
299	151	Westminster Amalgamated Charity				1	
300	151	Ricoh	1				
301	151	Sense	1				
302	151	Human Appeal				1	
303	151	Drop Point				1	
304	151	STK	1				
305	151	QEII Centre	1				
306	151	WMW	1				
307	151	Rotary				1	
308	151	Addison Lee	1				
309	151	KH Design	1				
310	127, 131	Transport Research Laboratory (TRL)					1
311	28, 36, 37, 115, 127	DG Cities		1			
312	28, 30, 31, 36, 37, 115	Innovate UK		1			

#	Initiatives	Organizations	A	B	C	D	E
313	36, 37	Magnetic Systems Technology (MAGTEC)	1				
314	32, 36, 53, 82, 115, 124, 125	Royal Borough of Greenwich Council		1			
315	37	Sheffield City Council		1			
316	37	Microlise	1				
317	115	Oxbotica	1				
318	115	Immense Simulations	1				
319	115	Nominet	1				
320	28	dRISK.ai	1				
321	28	Claytex	1				
322	131	FiveAI	1				
323	131	McLaren Applied Technologies	1				
324	63, 131	University of Oxford				1	
325	131	Arriva	1				
326	131	Direct Line Group	1				
327	125	Kiwi Power	1				
328	116, 125	Connected Places Catapult / Future Cities Catapult			1		
329	125	Green Doctor			1		
330	53, 124, 125, 126	Sharing Cities Consortium	1	1	1	1	
331	124	Charlton Athletic Community Trust (CACT)			1		
332	32	Enterprise	1				
333	137	Bazalgette Tunnel Ltd (Tideway)	1				
334	18, 137	Ofwat		1			
335	63, 137	Environment Agency		1			
336	137	Tideway West	1				
337	137	Tideway Central	1				
338	137	Tideway East	1				
339	137	Amey	1				
340	29	British Broadcasting Corporation (BBC)	1				
341	29	Smithsonian Institution	1	1			
342	29	Foundation for Future London			1		
343	136	South East Local Enterprise Partnership (SELEP)	1	1		1	
344	136	Kent County Council		1			
345	136	Essex County Council		1			
346	136	Thames Gateway Kent Partnership	1	1			
347	136	South East Creative Economy Network (SECEN)	1	1		1	
348	136, 144	University of Kent				1	
349	136	University of Essex				1	
350	136	Locate in Kent	1				
351	136	Metal			1		
352	136	Cement Fields			1		
353	8	Busk in London			1		
354	90	Linving Wage Foundation			1		
355	45, 86	London Food Link			1		
356	45	Guy's & St Thomas' Charity			1		
357	35	CARAS			1		
358	105	Laureus Sport for Good			1		
359	105	Nike	1				

#	Initiatives	Organizations	A	B	C	D	E
360	97	Comic Relief			1		
361	129	Sportsaid			1		
362	31	Gnewt	1				
363	31	Fleetcarma	1				
364	31, 63	Arup	1				
365	17	Emission Analytics	1				
366	17	The Real Urban Emissions (TRUE) Initiative			1		
367	16	Cross River Partnership (CRP)	1	1			
368	16	Better Bankside	1				
369	16	Camden Town Unlimited	1				
370	16	The Northbank	1				
371	16	Urban Partners	1				
372	16	Victoria BID	1				
373	16	We Are Waterloo	1				
374	107	National Trust			1		
375	149	Wildlife Trusts			1		
376	54, 149	Royal Horticultural Society (RHS)			1		
377	54, 149	London Wildlife Trust			1		
378	54	London Metropolitan University				1	
379	54	Groundwork			1		
380	54	Depave			1		
381	44	Hubbub			1		
382	10	QSA Partners	1				
383	10	Adidas	1				
384	10	Ted Baker	1				
385	10	Farfetch	1				
386	10	FW	1				
387	119	Wrap			1		
388	118	Water UK	1	1			
389	118	Chilly's	1				
390	118	City to Sea			1		
391	118	Robeco	1				
392	118	Welsh Government		1			
393	118	Heathrow Airport	1				
394	118	Soda stream	1				
395	118	Sipple	1				
396	118	MIW	1				
397	118	Seasalt Cornwall	1				
398	30	Cisco	1				
399	30	Cenex				1	
400	30	Nuvve	1				
401	30	E-Car Club	1				
402	78	CDP			1		
403	78	The B Team	1	1	1		
404	78	We Mean Business			1		
405	78	Siemens	1				
406	78	Sky	1				
407	78	Relx	1				
408	78	Informa	1				
409	78	Morgan Sindall	1				
410	78	Landsec	1				
411	78	ISG	1				

#	Initiatives	Organizations	A	B	C	D	E
412	18	Peabody Trust			1		
413	18	Stantec Consulting Inc	1				
414	18	Borough of Southwark Council		1			
415	18	Thames21			1		
416	18	Home Builders Federation (HBF)	1				
417	18	The Rivers Trust			1		
418	18	Affinity Water	1				
419	18	Leathermarket JMB			1		
420	96	London Drainage Engineers Group (LoDEG)		1			
421	63, 144	London Climate Change Partnership / Climate London	1	1	1	1	
422	144	Loughborough University				1	
423	144	Brunel University				1	
424	144	Engineering and Physical Sciences Research Council (EPSRC)		1			
425	63	Met Office		1			
426	48, 63, 141	Public Health England		1			
427	63	Department of Health and Social Care (DHSC)		1			
428	63	University of Greenwich				1	
429	63	LHC			1		
430	63	London Resilience	1	1			
431	48, 141	Healthy London Partnership		1			
432	141	Time to Change			1		
433	142	Something and Son	1				
434	103	College of Haringey, Enfield and North East London (CONEL)				1	
435	103	Borough of Barking and Dagenham Council		1			
436	103	London South Bank University (LSBU)				1	
437	103	London South East Colleges				1	
438	103	West London College				1	
439	25	HS2		1			
440	59	London Youth			1		
441	14	Wi-SUN Alliance	1				
442	14	Itron	1				
443	14	Urban Control	1				
444	85	City of London Police		1			
445	116	Intel Labs	1				
446	116	Climate-KIC	1	1			
447	99	EY	1				
448	57	Guerrilla Gardening			1		
449	70	Royal Borough of Kingston upon Thames Council		1			
450	58	Borough of Ealing Council		1			
451	58	Canal & River Trust			1		

Rio de Janeiro

Table B5

Rio de Janeiro's Organizations

#	Initiatives	Organizations	A	B	C	D	E
1	1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 16, 17, 18, 19, 25, 30, 31, 33, 34, 35, 37, 39, 40, 41, 43, 48, 49, 50, 51, 55, 56, 57, 58, 59, 60	Prefeitura da Cidade do Rio de Janeiro		1			
2	25	Assembleia Legislativa do Rio de Janeiro (ALERJ)		1			
3	25	Associação Brasileira de Agências de Viagens (ABAVRJ)	1		1		
4	20, 25	Universidade Estadual do Rio de Janeiro (UERJ)					1
5	25	Centro Universitário Estadual da Zona Oeste (UEZO)					1
6	25	Universidade Federal Fluminense (UFF)					1
7	25	Universidade Federal do Rio de Janeiro (UFRJ)					1
8	25	Universidade Veiga de Almeida (UVA)					1
9	25	Universidade Federal Rural do Rio de Janeiro (UFRRJ)					1
10	25	Universidade Estadual do Norte Fluminense (UENF)					1
11	25	TiRio	1				
12	25	Sociedade Nacional de Agricultura (SNA)	1				
13	25	Pontifícia Universidade Católica (PUC-Rio)					1
14	25	Sistema OCB/RJ	1				
15	25	Sindicato dos Bares e Restaurantes (SindRio)	1				
16	25	Sindicato das Empresas de Serviços Contábeis, Assessoramento, Perícias, Informações e Pesquisas do Estado do Rio de Janeiro (SESCON)	1				
17	25, 40	Serviço Brasileiro de Apoio às Micro e Pequenas Empresas (Sebrae)	1				
18	25	Sociedade dos Engenheiros e Arquitetos (SEAERJ)				1	
19	25	Rio Convention & Visitors Bureau (RioCVB)	1				
20	25	Redetec					1
21	25	RCE-Network RJ				1	
22	25	Ordem dos Advogados do Brasil (OAB-RJ)				1	
23	25	Instituto Brasileiro de Geografia e Estatística (IBGE)		1			1
24	25	Instituto Brasileiro de petróleo, gás e biocombustíveis (IBP)	1				
25	25	Associação dos Gestores do Estado do Rio de Janeiro (GestRio)		1	1		
26	25	Firjan	1				
27	25	Fundação Getúlio Vargas (FGV)					1
28	25	Federação das Empresas de Transportes de Passageiros do Estado do Rio de Janeiro (Fetranspor)	1				
29	25	Fetranscarga	1				
30	25	Fecomercio	1				
31	25	FC&BV RJ	1				
32	25	Federação Brasileira de Hospedagem e Alimentação (FBHA)	1				

#	Initiatives	Organizations	A	B	C	D	E
33	25	Facha				1	
34	25	Facerj	1				
35	25	ESPM				1	
36	25	FAERJ	1				
37	25, 52	Embrapa		1			
38	25	Conselho Regional de Medicina Veterinária do Rio de Janeiro		1			
39	25	CRCRJ		1			
40	25	CREA-RJ		1			
41	25	CRBio-RJ		1			
42	25	CRA-RJ		1			
43	25	CIEE			1		
44	25	CEPERJ		1			
45	25	CEFET/RJ				1	
46	25	Assespro	1				
47	25	Clube de Engenharia			1		
48	25	Anprotec	1	1	1	1	
49	25	Amcham	1				
50	25	Aeerj	1				
51	25	ADESG			1		
52	25	Associação Comercial do Rio de Janeiro (ACRJ)	1				
53	25	AB Telecom	1				
54	25	ABIH-RJ	1				
55	25	ABES			1		
56	25	ABE			1		
57	25	ABEOC	1				
58	30, 40	Companhia de Desenvolvimento Urbano da Região do Porto (CDURP)		1			
59	10, 18, 28, 30, 58	Empresa Municipal de Informática (IPLANRIO)		1			
60	9	Fundação Centro de Ciências e Educação Superior a Distância do Estado do Rio de Janeiro (CECIERJ)		1			
61	54	Projeto Ruas			1		
62	13	United Nations					1
63	50	Detran-RJ		1			
64	50	Fundação Leão XIII		1			
65	4, 17, 31, 32, 37, 40	Instituto Pereira Passos (IPP)		1		1	
66	42	Associação Saúde Criança (ASC)			1		
67	15, 29, 32, 45, 48, 49, 52	Governo do Estado do Rio de Janeiro		1			
68	21, 26	Companhia Municipal de Limpeza Urbana (Comlurb)		1			
69	21	Banco Nacional de Desenvolvimento Econômico e Social (BNDES)		1			
70	21	Universidade Federal de Minas Gerais (UFMG)				1	
71	21	Methanum Tecnologia Ambiental Ltda	1				
72	44, 45, 52, 61	Companhia Estadual de Águas e Esgotos do Rio de Janeiro (CEDAE)		1			
73	26	Fundação Rio Águas		1			
74	57	Obra Social Abrace o Rio			1		
75	57	Paróquia São José da Lagoa			1		
76	23	Begreen	1				
77	23	Via Parque Shopping	1				
78	33, 52	Governo Federal do Brasil		1			
79	52	Governo do Estado de São Paulo		1			

#	Initiatives	Organizations	A	B	C	D	E
80	52	Governo do Estado de Minas Gerais	1				
81	52	Inter-American Development Bank					1
82	52	Global Environment Facility (GEF)					1
83	48, 52	Instituto Estadual do Ambiente (INEA)	1				
84	52	Centro Universitário de Valença (UNIFAA)				1	
85	52	Fundação Grupo Boticário			1		
86	52	Fundação de Empreendimentos Científicos e Tecnológicos (Finatec)			1		
87	52	Empresa de Assistência Técnica e Extensão Rural do Rio de Janeiro (EMATER-RIO)	1				
88	52	Fundação Educacional Dom André ArcoVerde (CESVA/VAA)			1		
89	29	ENEL	1				
90	29	Serviço Social do Comércio (SESC)			1		
91	32	Empresa de Pesquisa Energética (EPE)		1		1	
92	32	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)		1			
93	55	Smart Luz	1				
94	11, 41	Instituto Novo Ser			1		
95	41	Michelin	1				
96	41	Ortotech	1				
97	41	Rico	1				
98	41	Usina da Comunicação	1				
99	41	Desginar	1				
100	41	Sarepta Therapeutics	1				
101	11	Embaixadores da Alegria			1		
102	33, 40	Caixa Econômica Federal		1			
103	33	Banco do Brasil		1			
104	7	Consórcio BRT	1				
105	27	Metro Rio	1				
106	31	Transporte Ativo			1		
107	5	Itaú	1				
108	5	Tem Bici	1				
109	53	Polen	1				
110	53	Orla Rio	1				
111	59	Noah	1				
112	18	Associação Brasileira de Mentores de Negócios (ABMEN)			1		
113	18	Instituto de Políticas de Transporte e Desenvolvimento (ITDP)			1		
114	37	Empresa Municipal de MultiMeios (Multirio)	1				
115	20	Cevis - Coletivo de Estudos sobre Violência e Sociabilidade			1	1	
116	20	Instituto de Pesquisa e Planejamento Urbano e Regional (IPPUR)				1	
117	20	Centro de Estudos e Ações Culturais e de Cidadania (CEACC)			1		
118	20	Grupo Eco Santa Marta			1		
119	20	Instituto Raízes em Movimento			1		
120	20	Instituto de Comunicação e Informação Científica e Tecnológica em Saúde (ICICT)				1	
121	20	Fundação Oswaldo Cruz (Fiocruz)				1	
122	15	Polícia Civil	1				

#	Initiatives	Organizations	A	B	C	D	E
123	15	Polícia Militar		1			
124	40	Concessionária Porto Novo	1				
125	40	Fundação Roberto Marinho			1		
126	40	Fundação Darcy Vargas			1		
127	40	Ação da Cidadania			1		
128	40	Instituto Nacional de Tecnologia (INT)		1		1	
129	40	Incubadora Afro Brasileira			1		
130	40	Instituto de Pesquisa e Memória Pretos Novos (IPN)				1	
131	40	Instituto Central do Povo			1		
132	40	Pier Mauá	1				
133	40	B3 Social			1		
134	40	Novotel Porto Atlantico	1				
135	40	Intercity Hotel	1				
136	40	Rede Rio Hotéis	1				